THE BAHAMA ISLANDS

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THE GEOGRAPHICAL SOCIETY
OF BALTIMORE

THE
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EDITED BY
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LETTER OF TRANSMITTAL

To Dr. Daniel C. Gilman,

President of The Geographical Society of Baltimore.

Sir.—I herewith transmit to you a report of the Bahama Expedition sent out by the Geographical Society of Baltimore on June 1, 1903. This, the first publication of the Society, contains sixteen distinct chapters on various subjects pertaining to the Bahama Islands. These papers have been prepared by specialists, most of whom were present on the Expedition and directed the work on their respective investigations. The material which this volume contains is largely the result of researches carried forward on the Expedition, but there are certain chapters which deal principally with facts discovered by earlier investigators. The object of these chapters is to summarize this material and thus increase the general usefulness of the publication. The appearance of this book, at a time when the certainty of the Panama Canal is drawing the attention of the civilized world to the American Mediterranean, seems most opportune; and it is hoped that the facts here published may be instrumental, if only in a small degree, in causing the Bahama Islands to share in the renewed prosperity which is destined to overtake the West Indies when the Atlantic and the Pacific oceans are united.

Trusting that this volume may meet with your approval, I remain,

Very respectfully,

George Burbank Shattuck,

Director of the Bahama Expedition.

Johns Hopkins University,
Baltimore, January 2, 1905.

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PREFACE

The two main objects which the Trustees of the Geographical Society of Baltimore have sought to accomplish by means of the Society are, first, to place before the public of Baltimore, at practically cost prices, an annual course of lectures dealing either directly or indirectly with geographical subjects; and second, to foster geographical research and, from time to time, publish monographs dealing with some particular piece of geographical investigation, carried on under the auspices of the Society. In pursuance of this latter object, the Bahama Expedition was organized and equipped, and sent out from Baltimore on the first day of June, 1903, to the Bahama Islands. The object of this Expedition was to investigate the origin and natural history of the Islands and also to conduct studies along lines intimately associated with the well-being of the inhabitants.

In the organization of the Expedition provision was made and suitable men selected to carry on investigations in Geology, Paleontology, Tides, Terrestrial Magnetism, Climate, Exploration of the Upper Atmosphere, Soils and Agricultural Conditions, Vegetation, Mosquitoes, Fishes, Batrachians and Reptiles, Mammals, Birds, Sanitary Conditions, Commercial Geography, and a History of the people who have inhabited the Islands. The names of those who carried forward these investigations are given in another part of this volume.

For many months previous to the day of departure the Director of the Expedition was busily engaged in organizing and equipping the various departments, in order that each might work as far as possible independently of all the others. For the work in geology, barometers, levels, hammers, and the necessary collecting outfit were supplied. For the work on tides and terrestrial magnetism the U. S. Coast and Geodetic Survey kindly loaned to the Expedition a tide-gauge and instruments for a magnetic survey. For the work on climate, the U. S. Weather Bureau cooperated and supplied the Expedition with kites, barometers, thermographs, and other instruments for making automatic records of meteorologic conditions. For the work on soils the Bureau of Soils, U. S. Department of Agriculture, kindly loaned one of their field equipments, containing a complete field laboratory for the chemical examination

of soils. For the work in botany, all the necessary equipment for collecting and preserving plants was provided. For the work on mosquitoes, collecting jars, preserving fluids, and other necessary apparatus were supplied. For the work on fishes, tangle-bars and oyster-dredges were furnished by the Expedition; a hand-windlass for deep-sea dredging was kindly loaned by the University of Iowa; nets and deep-sea dredges were furnished to the Expedition by the U. S. Fish Commission, and a glass-bottom boat was contributed by Mr. Bernard N. Baker, of Baltimore. For the work on land zoology, guns, ammunition, collecting bags, chests for skins, preserving fluids, etc., were supplied. For the work on sanitary conditions, the Expedition furnished a supply of drugs and instruments which was as complete as possible. The care of the members of the party was the first consideration, and no expense was spared in order to be prepared for any emergency which might arise. In addition to the above a naphtha launch, cameras, and a library containing books relating to the Bahama Islands were supplied for the use of all the party.

This equipment, together with provisions for a two months' cruise were placed on board the *Van Name*, a one hundred ton schooner which had been chartered for the Expedition. The cabin of this ship was set aside for an office and reading room, and the various staterooms opening from it were used as laboratories and a dark room. The men were quartered in the hold, which had been renovated and freshly painted.

As a number of the men who took part in the Expedition were on leave of absence from various government bureaus for the months of June and July only, the time at the disposal of the Expedition was limited. Every effort was made to so arrange matters that work could go forward with the greatest possible dispatch. Unfortunately, however, storms, head winds, and calm weather prolonged the outward voyage and the vessel did not arrive at Nassau, its first stopping place, until the 17th of June. It was necessary to leave before the end of July in order to reach Baltimore at the time appointed. This left about five weeks in which to prosecute the work. It was fully intended to explore some of the more southerly islands of the Bahama group, but the plan was finally abandoned on account of the loss of time occasioned by unfavorable sailing conditions. However, the Expedition visited Abaco, New Providence, Andros, Green Cay, and the Eleuthera group of islands, Cat Island, Long Island, Rum Cay and Watlings Island.

Although the work of the various staffs was somewhat diversified, there was little difficulty experienced in adjusting the needs of each. The historian,

Mr. Wright, was left at Nassau where he made a study of original records and returned to Baltimore independently of the Expedition late in September. Dr. Fassig and Mr. Routh also spent considerable time at Nassau, but were with the Expedition again at Watlings Island and Long Island. The other members of the scientific staff accompanied the vessel throughout the cruise.

Most of the work was done on shore, so that as soon as the vessel came to anchor at any particular station, the various corps were landed, conducted their work independently, and returned to the ship to eat and sleep. Frequently, while work was being conducted on land, Mr. Bean and his corps would either take the naphtha launch and glass-bottom boat on a collecting tour or else the large vessel would be placed at their disposal for dredging. While the Expedition was at Nassau, a laboratory was established in a private house, so that chemical analyses of the various soil types could be made. The botanists also secured another room where they could conduct certain branches of work which the motion of the vessel made impracticable on shipboard.

It will be readily understood that much of the work done in the field by the Expedition was only preliminary to studies conducted later in laboratories. The material which is published in this volume is the result of a large amount of work subsequent to the return of the Expedition to Baltimore. As a rule, the Directors of the various staffs are the authors of the chapters in this book, but Dr. L. O. Howard, who was not present on the Expedition, has kindly written the introduction to the chapter on mosquitoes, while Mr. Leonhard Stejneger and Mr. Gerrit S. Miller have cooperated in the work of land zoology and written respectively the chapters on reptiles and mammals. Dr. William H. Dall has studied and discussed the collection of fossils. Mr. L. P. Shidy has reduced the tide-gauge observations and written the chapter on tides; and officials connected with the Division of Terrestrial Magnetism of the U. S. Coast and Geodetic Survey have kindly reduced the magnetic observations taken by Dr. O. L. Fassig and compiled the tables which are published in the chapter pertaining to the magnetic survey.

It would have been impossible for the Director of the Expedition to have accomplished even the smallest results had it not been for the earnest and enthusiastic cooperation of his colleagues, and acknowledgment is here heartily given to these gentlemen for their incessant work while in the Bahamas. The Director also wishes to take this opportunity to express his appreciation to the Trustees of the Society and of the Johns Hopkins University for their generous response to his needs in organizing and equipping the Expedition; to the

U. S. Department of Agriculture, U. S. Coast and Geodetic Survey, U. S. Weather Bureau, and the U. S. Fish Commission for the loan of necessary apparatus; to the Government of the Bahama Islands for a generous appropriation to meet part of the expenses incurred in conducting the soil survey; to His Excellency, Sir Gilbert T. Carter, former Governor of the Bahama Islands, for his personal support and interest in the work of the Expedition; to Mr. C. Tyldesley Sands of Nassau and Messrs. Penniman and Brown of Baltimore for generous and personal services in connection with the soil survey; to Mr. H. M. Flagler for many courtesies; to Mr. Bernard N. Baker, for the gift of the glass-bottom boat; to the Notre Dame of Maryland; and to the many friends of the Society who personally gave financial aid to the Expedition and who later, in a similar manner, encouraged the publication of this volume.

The U. S. Hydrographic office kindly furnished transfers from their own stones for the base of the bathymetric map shown in Plate X. The bases for the various soil maps (Plates XXVIII-XXXII) have been reengraved from Admiralty charts. The hurricane charts (Plates XVIII-XXIV) have been revised and brought down to date from similar charts previously published by the U. S. Weather Bureau. Mr. A. H. Baldwin, the well-known artist, accompanied the Expedition, and made the original colored sketches from which the lithographs of fishes (Plates LII-LXI) have been reproduced. The originals for the figures of mosquitoes (Plates XLVIII-LI) were also drawn by Mr. Baldwin and kindly loaned to the Editor by Dr. L. O. Howard. Mr. J. B. Smith, State Entomologist of New Jersey, furnished the electrotype for Figure 5, and the Maryland Weather Service, the originals for Plate XIV, Fig. 1, and Plate XVI. Mr. George N. Saegmuller, of Washington, D. C., kindly furnished the original for the figure of the tide-gauge (Plate XIV, Fig. 2). The figures of fossils (Plates XI-XIII) are the work of Miss Frances Wieser, of Washington, and Plates LXXVII, LXXVIII and LXXIX are the work of Mr. Hermann Becker, of Baltimore. Messrs. Forrest Shreeve and Albert Sommerwerck, of Baltimore, have aided in the clerical work of this volume.

PHYSIOGRAPHY AND GEOLOGY OF THE BAHAMA ISLANDS

BOUGAINVILLEA IN A NASSAU GARDEN.

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BY

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AND

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INTRODUCTION.

Along the northeastern margin of the West Indies, extending from southern Florida to eastern Haiti, is a group of three thousand or more low islands, keys, rocks and banks, to which the name Bahama Islands has been given. Most of these islands are small; many of them are nothing more than rocks or sand-bores, but they are so scattered that the archipelago as a whole, including the submerged banks in the extreme south, extends from 27° 30′ to 19° 50′, north latitude and from 68° 45′ to 80° 35′, west longitude. In other words, the Bahama Islands occupy a region nearly as extensive as Great Britain, and if superimposed on the surface of the United States they would extend from New York southward to Atlanta, and in their widest part from Cape Hatteras, westward to New Bern, in the heart of the Alleghany mountains, in western Virginia.

As the archipelago is separated into a northern and southern half by the Tropic of Cancer, which crosses it almost exactly in the middle, the climate is practically tropical throughout. The eastern margin of the Islands is washed by breakers which roll in unchecked from the broad surface of the Atlantic Ocean, while the western edge is swept by the Gulf Stream as it flows northward through the Straits of Florida. The Islands also lie in the region of the West Indian hurricanes and have been repeatedly swept by terrific cyclones which have proved important geologic agents both of deposition and erosion.

When considered from a geological point of view, the Bahamas afford an interesting study, in that they are composed almost entirely of debris derived

from corals and other calcareous organisms and rest on a shallow, submerged, platform, which is separated by deep submarine troughs from the neighboring land-masses of North America and the West Indies.

PREVIOUS INVESTIGATION.

Although there has been considerable written about the Bahamas in books of travel and in popular magazines, this group has received less careful geological study than almost any other portion of the West Indies.

For our knowledge regarding the form of the submarine bottom on which the Bahamas rest, and its relation to North America and the West Indian regions, we are chiefly indebted to the excellent charts published by the British Admiralty, the U. S. Coast and Geodetic Survey, and the U. S. Hydrographic Office. These charts, by indicating a large number of soundings, bring out very clearly the figure and character of the platform from which the Bahama Islands rise.

Capt. R. J. Nelson, R. E., was the first to adequately describe these Islands and to bring their true nature to the attention of geologists.[1] He regarded them as composed of calcareous sand which had been thrown up by the waves to form beaches, and later picked up by the winds and piled into dunes. He saw no evidence of either uplift or subsidence during recent time, and concluded that the Islands had remained stationary in their position during the present epoch. In this connection he says: "Whatever may be the real foundation of the Bahamas, whether, like the West Indian Islands generally, they are indebted to igneous agency for their existence as elevated masses, or otherwise, there is *no evidence* of such elevation having taken place either in the Bahamas or Bermuda. On the contrary, the total absence of coral-reefs in mass, or even of detached coral blocks, *above* the tide-line leads us to the supposition that no upheaval has taken place during the present epoch. . . . The fact of detached blocks of coral being found *in* the rock at considerable distance from the sea-coast *at the tide-level*, proves that no subsidence has taken place during the present epoch. Conch-shells also, either dispersed or in beds, are found by the well-diggers in the solid rock at about the sea-level, and thus bear evidence to the same fact."[2] It was from this paper of Capt. Nelson that Darwin and Dana drew their facts when later they described the Bahamas in their discussions on the origin of coral islands.

[1] On the Geology of the Bahamas. Quar. Jour. Geol. Soc. London, 1853, vol. ix, pp. 200-214.

[2] *Loc. cit.*, pp. 212-213.

In about the year 1890 Dr. John I. Northrop spent six months in the Bahama Islands, during which time he visited New Providence and Andros. On his return to the United States he published an account of his observations.[3] This paper is especially interesting from the fact that he believes that the Bahamas are rising. "I think the facts I have given justify my conclusion in regard to the recent elevation of Andros and New Providence. It is probable that the elevation extended over the rest of the Bahamas, as caves exist on the other islands. What the Bahamas are doing to-day, of course, we cannot tell; but until we have proof to the contrary, we may assume that they are rising."[4]

No other work of importance appeared until Prof. Alexander Agassiz published his researches on the Bahamas.[5] The reconnoissance which Agassiz here describes was undertaken during the winter and early spring of 1893. He had at his disposal the steamship *Wild Duck*, and cruised throughout the entire archipelago. The descriptions of the Bahamas which he gives in the Bulletin are very complete and are the best which have ever been published. As a result of his researches he concluded that the Bahamas had at one time stood higher and were more extensive than at present; that they had subsequently subsided for at least 300 feet; and that during this period their areal extent had been further diminished by erosion. In this connection he says: "After the formation of the islands came an extensive gradual subsidence, which can be estimated at about three hundred feet, and during this subsidence the sea has little by little worn away the æolian hills, leaving only here and there narrow strips of land in the shape of the present islands. . . . Subsidence explains satisfactorily the present configuration of the Bahamas, but teaches us nothing in regard to the substratum upon which the Bahamas were built. Indeed, the present reefs form but an insignificant part of the topography of the islands, and they have taken only a secondary part in filling here and there a bight or a cove with more modern reef rock, thrown up against the shores so as to form coral reef beaches such as we find in the Florida Reef."[6] Agassiz evidently did not observe any of the raised marine deposits which are discussed later in this chapter, for he says: "I did not meet anywhere with deposits

[3] Notes on the Geology of the Bahamas, Trans. N. Y. Acad. Sci., 1890, vol. x, Oct. 13, pp. 4-23.

[4] *Loc. cit.*, p. 22.

[5] Observations in the West Indies, Am. Jour. Sci., 1893, vol. xiv, pp. 358-362. A Reconnoissance of the Bahamas, etc., Bull. Mus. Comp. Zool., 1894, vol. xxvi, No. 1, pp. 1-108.

[6] *Loc. cit.*, p. 7.

either of corals or of mollusks, the position of which could not be satisfactorily accounted for as resulting from the action of winds and waves, or hurricanes."[7]

One of the results of these various researches was to establish the fact that the Bahama Islands stood on a shallow, irregular, platform which rose out of great depths, not only from the Atlantic on the east, but also from the bottom of the West Indian region on the west. In order to account for the irregularities in the margin of this platform, Dr. J. W. Spencer published two papers[8] in which he argued that the Bahama Islands, together with the rest of the Caribbean-Gulf regions had been formerly much elevated and during this period of elevation had undergone considerable erosion so that its surface became deeply dissected with river-valleys and canyons. Later, when the region sank to its present position, these valleys were submerged and gave rise to the various passages between the Islands as well as to the embayments which make the outline of the Bahama platform so irregular.

During the month of April, 1902, the senior author of this chapter made a geological reconnoissance of a portion of the Bahama Islands, and later, during June and July of 1903, while a Director of the Bahama Expedition sent out by the Geographical Society of Baltimore, he, in connection with Dr. Miller, examined further into the structure of the Islands. The conclusions which seemed to be justified by these studies were published just after the return of the Expedition.[9] They were as follows:

"The present survey has been able to determine that the material composing the Bahama Islands is not entirely made up of wind-blown coral and lime sand, but the lower portions of many of the islands, extending up to ten or fifteen or twenty-five feet above the present level of mean tide, has been deposited by the ocean and contains marine organisms in large numbers. Above this lies the deposit of wind-blown material which has up to this time been regarded as the sole type of deposit visible throughout the archipelago.

"In regard to the question of elevation or subsidence, the survey has determined that both processes have taken place. The Islands were doubtless much higher at one time than to-day, and it is equally certain that they were formerly more depressed beneath the Atlantic Ocean than they are now. It is impossible to say whether they are being elevated or submerged at the present time, as the

[7] *Loc. cit.*

[8] Reconstruction of the Antillean Continent, Bull. Geol. Soc. Am., 1895, vol. 6, pp. 103-140, and Resemblance between the Declivities of High Plateaus to Those of Submarine Antillean Valleys, Trans. Can. Inst., 1898, vol. v, pp. 359-368.

[9] Science, N. S., 1903, vol. xviii, p. 428.

process is extremely slow at best, and can only be detected by careful measurement extending over long periods of time."

From this résumé it will be seen that four views have been held at various times by those who have studied the geology of the Bahamas. Nelson concluded that the Islands were stationary; Northrop, that they were probably rising; Agassiz, that they had been depressed; and lastly, Shattuck and Miller, that the Islands had undergone a former elevation; followed by a more recent depression, which in turn had given place to a still later elevation; but as to whether the Islands are now stationary or experiencing a change in level no opinion was expressed.

PHYSIOGRAPHIC FEATURES.

The physiographic features of the Bahama Islands fall into two groups, a submarine and a subaërial. Those belonging to the first division are largely hidden from direct observation, beneath the surface of the ocean, and have been only roughly ascertained by means of the sounding-line. Those of the second division are everywhere open to observation and constitute the topographic features of the Islands.

Submarine Division.

The Bahama Islands rest on a submerged platform which rises on all sides abruptly from the surrounding depths of the ocean. This platform is the most significant physiographic feature of the Bahama Islands, and will be considered first in relation to surrounding regions; second, in regard to its own contour and slope; and third, in regard to the character of its surface.

Relation with surrounding regions.—Between the great land-masses of North and South America there is a region of land and water including southern Mexico, Central America, the islands of the West Indies, the Gulf of Mexico and the Caribbean Sea, which has long been a puzzle to geographers and geologists. As a result of a vast amount of tedious sounding it has finally been ascertained that the American Mediterranean, as this region is appropriately called, is divisible into three great basins. In the northwestern portion is a huge depression which is filled by the Gulf of Mexico; in the southeast a still greater one is occupied by the Caribbean sea; while between them a third, deeper than either of the others, holds the waters which lie between Yucatan and Cuba. These three basins not only are separated from each other by broad banks which rise like partitions between them, but they are also cut off from

free communication with the ocean beyond, by another bank which connects the coast of South America with Florida.

Although these banks are for the most part submerged, they are none the less real; for, not only do they prevent the cold water at the bottom of the Atlantic from getting over into the basins of the Caribbean-Gulf region, but they also exclude free circulation of the waters within the region itself.

The islands of the West Indies are nothing more than the superficial portions of these banks or ridges which happen at the present epoch to rise above the surface of the water. These dry land summits are, in terms of geology, transitory and uncertain. They have not always been as they are to-day, nor will they remain so in the future; but they change their shapes and positions in response to movements of the earth's crust of which they form a part. The Bahama Islands which are to be considered as the summits of a portion of the eastern ridge connecting South America with Florida are no exception.

Contour and slope.—The flat-topped ridge or platform from which the Bahama Islands rise extends from southern Florida to eastern Haiti. By an examination of the map which accompanies this chapter[10] (Plate X) it will be seen that this platform rises rapidly from the deeper regions which surround it on all sides. The steepest ascent is along the eastern face of the platform, where it abruptly rises from the bottom of the Atlantic to the surface of the ocean—a vertical distance of 2500 fathoms—in a little less than 25 miles. On the south, west and north, the ascent, although rapid, is not so pronounced as towards the Atlantic for the reason that the waters east of Florida, Cuba, and Haiti are not as deep. On all sides, however, the platform is so well marked that it stands out as a great submerged tableland from the surrounding ocean-bottom.

The northwestern half of the Bahama platform varies greatly from the southeastern. Not only is it shallower, lying for the most part, as in the Great and Little Bahama Banks, only a few feet or fathoms beneath the surface of the ocean, but also it is less broken than the latter, and carries the largest islands. The islands of the southeastern half are arranged in small groups and rise rapidly on all sides from a lower portion of the platform. They are also separated from each other by wide passages.

[10] The base of this map was engraved from transfers kindly furnished by the Hydrographic Office. To this the bathymetric contours and colors have been added. The general appearance of this map is similar to the one published by Professor Agassiz in his "Reconnoissance of the Bahamas," but it differs from it in that the area included is not the same, more contours and details have been introduced, and a different system of colors employed.

FIG. 1.—VIEW OF SAIL ROCKS SHOWING MARINE EROSION

FIG. 2.—VIEW OF HIGHWAY ON SUMMIT OF BLUE HILLS, NEW PROVIDENCE

PHYSIOGRAPHIC AND GEOLOGIC VIEWS

The irregular outline of the Bahama plateau is one of its most significant characteristics. In the northeast portion this is particularly well marked on account of the separation of the Little and Great Bahama Banks by Providence Channel and also by the embayments known as "Tongue-of-the-Ocean" and "Exuma Sound." These embayments dissect the Great Bahama Bank so that it resembles a letter S and admits the deep waters of the ocean into the very heart of the plateau. The southeastern half of the platform does not appear so irregular in outline; but this is due to the fact that passages such as Crooked Island, Caicos, Turks, and Silver Bank have taken the place of embayments; or, in other words, that erosion has destroyed whatever connecting banks formerly existed and now allows the ocean to pass unobstructed between the individual island groups.

There is another feature which marks the northwestern portion of the plateau strongly from the southeastern, and that is the greater preponderance of shallow water in the former and of deep water in the latter. Throughout the northwestern, Little and Great Bahama Banks, with the islands which they carry on their surfaces, stand out in marked contrast to the more insignificant banks of the southeastern half, which form groups independent of one another. This contrast between the two divisions of the Bahama platform conveys the impression that the surface as a whole slopes toward the southeast. This impression is increased from the fact that the Silver and Navidad Banks, situated in the extreme south, are devoid of islands. But one should not too quickly conclude from this that the platform is actually depressed toward the southeast. On the contrary the facts would seem to indicate that the difference in depths of water are due not so much to deformation as to differential erosión and that the southeastern half has suffered relatively more than the northwestern.

Surface.—The surface of the Bahama platform is divisible into a deep-water and a shallow-water facies. The former, as has just been said, is more extensively developed throughout the southeastern half of the region, while the latter dominates the northwestern. Concerning the physical features of the surface, the methods employed in the exploration of the deep-water facies have not been sufficiently delicate to reveal more than salient features. Judging from the data procured from soundings, its surface appears to be flat and practically featureless except where it rises abruptly to form banks and pass over into the shallow-water facies. More is known regarding the shallow-water facies, for it lies so near the surface of the ocean that it can be distinctly

seen through the clear water which covers it. Aside from the islands, keys, and rocks, which will be discussed later, three features stand out prominently. They are coral reefs, sand bores, and marine ocean-holes.

Everywhere over the surface of these shallow banks coral heads and reefs are to be found. Along the more exposed eastern face, the coral polyp flourishes and builds extensive barrier reefs making that shore practically inaccessible to shipping, while over the surface of the more sheltered banks individual coral heads and small reefs are constantly encountered. These cause the bottoms to shallow suddenly and are consequently much dreaded by sailors. Dangerous reefs are frequently scattered so thickly over the surface of the banks that it has proved impracticable to chart them. The waters where they occur are avoided by vessels of large draft, and navigation is never attempted save in broad daylight and with a sailor at the bow to notify the helmsman of approaching reefs.

Sand bars or "sand bores" as they are usually called occur in greatest abundance over the surface of the bank south of the Tongue-of-the-Ocean. In this region they are so numerous as to make it dangerous for even light shipping during times of ebb tide. These sand bores are very low bars of white, coral sand which collect on the banks and frequently rise a few feet above the surface of the ocean. During ebb tide they are laid bare in great numbers, but during high water most of them disappear. They are not fixed in one position, but shift about with the ever-changing currents.

Submarine ocean-holes, or "blue holes" as they are frequently called, are, as the name indicates, deep holes which open suddenly downwards from the surface of the banks. In the Bahamas, the color of shallow water is green, and of deep water, blue; so that depth is indicated by color. The presence of an ocean-hole is therefore shown by an isolated area of blue water in the midst of a sea of green; hence the term "blue hole." These ocean-holes vary in diameter from a few feet to a quarter of a mile or more. Their sides beneath the opening frequently flare out like a bottle, and are usually covered with healthy branches of growing coral and many different varieties of marine plants, showing that there is a constant circulation of water. Numerous attempts have been made to ascertain the depth of these holes, but only in a few cases have lines succeeded in reaching the bottom. Agassiz found that some of the holes which he fathomed were at least 300 feet deep. It has been frequently observed that the water boils or rushes through these ocean-holes in harmony with the ebb and flow of the tide, proving that they are connected with deep

water beyond. Although these ocean-holes are occasionally met with they cannot be considered of common occurrence. Agassiz states that the principal ones are as follows:[11]

One 5 to 6 miles from Hawks Bill Rock; three, of 18, 24 and 13 fathoms, a little north of Blue Hole Point. These are about 5 miles apart on a northerly line. There are two more, of 17 and 38 fathoms, in the extension of a line of Blossom Channel leading from Tongue-of-the-Ocean upon the bank. There is also a 15 fathom hole at High Point on Andros, and a 20 fathom hole in the middle bight between Gibson Key and Big Wood Key.

The senior author of this paper had a novel experience at this particular ocean-hole during his first cruise in the Bahamas. After a long search the locality was discovered one evening at sundown, and the ship brought to anchor for the night close by. The boat, as she lay at rest, was about an eighth of a mile from the ocean-hole. The surface of the water above the hole was covered with a circular mass of foam about 15 feet in diameter, rotating slowly in a direction contrary to the hands of a watch. All hands on board could plainly see from the distance at which the boat stood that the surface of the water above the hole sagged and took on a saucer-like depression. A boat was quickly lowered and rowed cautiously toward the ocean-hole. As soon as it arrived in the saucer-like depression it was caught in the whirlpool and moved slowly round and round with the motion of the water. Looking down, the opening into the cavern beneath could be distinctly seen and it was evident, as the tide was flowing, that this ocean-hole communicated with other caverns at a distance, possibly on the island of Andros, and that the water was being sucked down through the opening to find its way into unknown parts. The walls of this ocean-hole were lined with living coral and marine plants. An attempt was made at sounding but the lead did not succeed in reaching bottom.

Distribution of Islands.—These various islands and keys are distributed unequally throughout the archipelago. By far the greater number are confined to the northwestern half and lie for the most part around the periphery of the banks, where they descend suddenly to deep water. In the southwestern portion of the Bahamas the islands are less numerous and are assembled in clusters, which rest on isolated banks, while in the extreme south, keys and rocks give place to submerged banks.

[11] *Loc. cit.*, p. 42.

Character of Surface.—The topography of these land fragments consists of features which rise in relief and others which sink as depressions beneath the general surface. The features of relief are dunes of coral sand and ridges of hard rock. The depressions consist of lakes, ponds or marshes, ocean-holes, banana-holes, and a general rough surface.

Dunes occur with great frequency along the sea-shores, where the winds have an opportunity to blow the calcareous sand up into heaps dazzling in the sunlight. These bear the characteristic vegetation and consolidate rapidly into soft rock, so that the tendency is to grow in height rather than to migrate inland. These dunes are distributed generally throughout the archipelago, but perhaps they are well developed as anywhere along the eastern side of Eleuthera fronting the ocean. There appears to be no very well defined line of separation between these half consolidated dunes, and the ridges of hard rock. Both have the same origin, as well as a similar topography, and one passes into the other with insensible gradations. The oldest dunes are hard rock, while the youngest are loose sand, and there is every intermediate stage. These ridges cross the islands in ranks like the dunes, and where an island has suffered severely from erosion, are frequently the only remaining features to mark the once more continuous land surface. The highest of these ridges are met with in Cat Island, where they rise to about 400 feet, but this is uncommon. They are usually low, rolling hills, scarcely high enough to break the monotony of the landscape.

Subærial Division.

Professor Agassiz has given such minute and careful descriptions of the various islands of the Bahama archipelago,[12] that it is unnecessary to go over the same ground here. Those desiring detailed descriptions are referred to the monograph mentioned above. In this paper only the salient features which apply to the group as a whole will be considered.

Classification.—The Bahama Islands consist of some three thousand or more islands, keys, and rocks, which Agassiz has classified in the following manner:[13]

First, sunken banks like the Navidad, Silver and Mouchoir Banks; second, islands occupying the whole or nearly the whole summit of the banks from which they rise, as Watlings, Rum Cay, Concepcion, Plana Cays, Inagua, and the atoll of Hogsty; third, banks having a resemblance to atolls, like Crooked

[12] *Loc. cit.*

[13] *Loc. cit.*, p. 11.

Island and Caicos Banks, which are fringed with low islands, so as to form a crescent with a shallow open lagoon in the interior; fourth, Salt Cay Bank, which is intermediate between first and third classes; fifth, composite banks like the Little and Great Bahama Banks which carry characteristics causing them to resemble all of the others.

On the larger islands, lakes, ponds and marshes are frequently met with. Many of these are shallow, while others are quite deep and are connected more or less directly with the ocean. They are usually undrained, contain brackish water, and their shores are lined with mangroves and other characteristic salt-loving plants. Examples of these are Lake Killarney and Harold Pond (Plate V, Fig. 1) on New Providence. The shores of these lakes advance and recede with the filling or desiccating of the body of water within.

One of the most beautiful brackish lakes in the Bahamas is located in the interior of Watlings Island (Plate V, Fig. 2, and Plate XXXII). It is known as Great Lake, contains brackish water, and is reported to be connected with the sea beyond. On the day that the Expedition visited this lake, foam from the water had been blown up on the beach into drifts which quivered in the breeze like piles of eider-down. An additional interest is attached to this lake as it is believed to be the one seen by Columbus on the morning of the day when he first touched foot in America.

In addition to these lakes there are deep, well-like depressions filled with salt water and connected with the ocean by subterranean passages. They ebb and flow with the tide, support marine life, and in all essential features resemble the submarine ocean-holes, except that they occur on land, usually removed some distance from the sea. One of the most perfect of these occurs at Tarpum Bay, just behind the settlement and at a distance of about a quarter of a mile from the sea-shore (Plate IX, Fig. 1). This terrestrial ocean-hole is circular in form and is said to be 100 feet deep. It contains salt water, and one standing on the rim can distinctly see marine fishes swimming about in the water below. The surface of this water changes with the tide and there is no doubt that a subterranean channel connects this hole with the ocean outside.

There are all gradations between these terrestrial ocean-holes and a smaller type of well-like openings known as "banana-holes." These banana-holes are cylindrical depressions with perpendicular sides and attain at times a depth of 25 feet or more. Their bottoms are usually lined with soil or mud, but at other times contain brackish or salt water which ebbs and

flows with the tide. Others have no such connection and remain dry except when filled with rain-water. These holes range downward in size until they merge with the general rough surface of the country. The smaller ones having a depth of 5 or 10 feet usually contain rich soil and are used to grow bananas; hence the name.

Throughout the Bahamas the surface rock is extremely rough and is carved into innumerable cavities and holes. When these openings are about the size of a flower pot they are known as "pot-holes"; although they are due to solution and not to mechanical erosion. These pot-holes are filled with rich soil and in them the pineapple plant is cultivated.

GEOLOGICAL FEATURES.

The Bahama Islands are built out of sediments derived from the destruction of coral and other calcareous organisms. Nothing is known regarding the geology of the platform on which these Islands rest, but, if it is similar to other ridges of the West Indies, its geology is complex and the veneer of white calcareous sand simply covers it like a shroud. These sedimentary rocks, out of which the Islands are built, have been deposited by three agencies, air, water, and organisms. Each one of these types will now be considered.

Eolian Deposits.

These deposits include the dunes and rock-ridges described in a previous section. These dunes are composed of half solidified calcareous sand blown up from the sea-shore, while the ridges of hard rock are ancient dunes cemented to solid limestone. They both contain fossil land-shells and have a cross-bedded structure. This cross-bedding may be seen wherever the rock has been excavated. The fresh surfaces thus exposed weather quickly, but as the various layers do not decay at the same rate, the cross-bedded structure is brought out in a striking manner. Such exposures may be seen in the various quarries of Nassau and in the approach to the bridge leading to Government House (Plate IV). This cross-bedding can also be seen from the sides of the road where the highway leading to the south passes over the summit of Blue Ridge (Plate II, Fig. 2).

Fossil land-shells are frequently discovered in these aeolian deposits. A representative collection was secured and submitted to Dr. Dall who has discussed it in the succeeding chapter. The manner in which these shells are entombed is most interesting. The surface of the dunes supports a scant

FIG. 1.—VIEW SHOWING SURFACE OF WAVE ERODED LIMESTONE, SAIL ROCKS

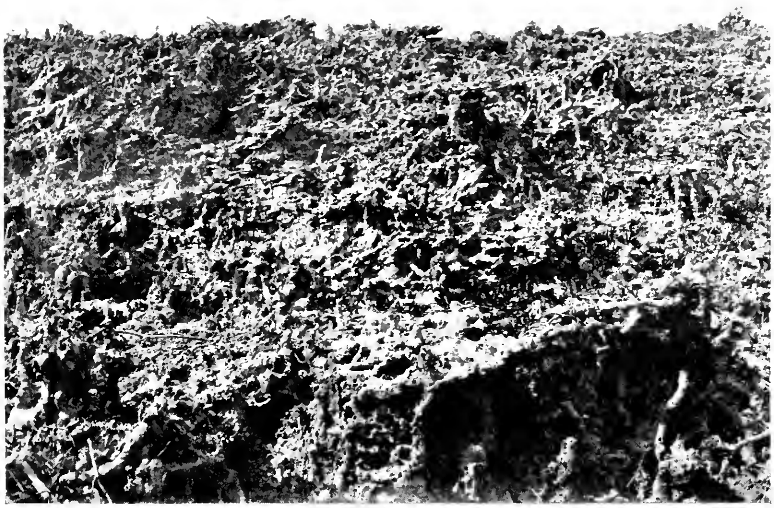

FIG. 2.—VIEW OF WAVE ERODED LIMESTONE, SHOWING CASTS OF ROOTS AND OTHER VEGETABLE REMAINS, SAIL ROCKS

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vegetation which has become adapted to this semi-arid environment. The leaves of these shrubs support large numbers of land-shells, which feed on them and at death become detached and falling to the ground accumulate about the base of the plants. Drifting sand quickly covers them over and they become true fossils. In digging around the roots of these plants, one can uncover a large number of these shells. As the dune thickens and grows in height, these organisms become buried deeper and deeper and, when the sand solidifies to hard rock, they become cemented into one mass with the surrounding particles.

Vegetable remains and especially casts of roots occur abundantly in the æolian deposits. These are particularly noticeable where the waves have etched out the softer parts of the matrix and have left the more consolidated casts to stand out in relief, giving to the surface a rough and scoriaceous appearance (Plate III, Fig. 2).

Aqueous Deposits.

The deposits formed by the agency of water have either been laid down at the bottom of the small ponds described above or by the waves and currents of the ocean. The deposits made at the bottom of the small lakes are of little extent. They, however, are of considerable importance in that they carry the remains of the organisms which inhabit the various brackish water lakes. Great Lake in the interior of Watlings carries large numbers of shells; also the salt pans on Rum Cay (Plate XC, Fig. 1). The deposits which line the bottoms of these salt pans contain large numbers of fossil shells, which belong to a fauna derived from the ocean outside but adapted to living in their peculiar environment. The fossils collected at Rum Cay were submitted to Dr. Dall who has discussed them in another chapter.

In many places it was found that these æolian deposits rested on lower beds of marine origin, which were frequently very fossiliferous. Localities where these marine beds were observed finally became so numerous and were so widely distributed that the conviction became irresistible that the substratum of the Bahamas, throughout at least the northwestern portion of the archipelago, was marine. At certain places, as for instance, on Rum Cay, these marine deposits extend as high as 15 or 20 feet above sea level. The æolian deposits are therefore to be considered as a superficial blanket covering these basal marine sediments. A list of localities where these marine deposits were found, together with the fossils from each, is given by Dr. Dall in the next chapter.

A quarter of a mile west of Clarence Harbor the contact between the

æolian and marine rocks is shown more distinctly than in any of the other localities visited by the Expedition. Along a canal which has been cut to admit water in a salt pan, some excellent sections are shown. The lower part of the section contains great quantities of marine fossils, while above, land forms are equally abundant. These two deposits are not separated by any pronounced break, but if the section could be traced for any distance it is probable that an unconformity would appear.

The surface of the banks is everywhere covered with a snow-white mantle of calcareous sand and mud derived chiefly from the erosion of coral reefs. In the region south of Tongue-of-the-Ocean these sediments are heaped into sand bores by the currents. In the bights and along the western shore of Andros, as well as along the western shore of Abaco, on the bottom of Wide Opening and other places, there is a peculiar deposit of finely divided calcareous mud known as "white marl." This has the consistency of chalk and may, in fact, be considered to be a modern chalk deposit. The following is an analysis of this white marl from Middle Bight, Andros, which the Bureau of Soils, U. S. Department of Agriculture, has been kind enough to furnish:

Potash (K_2O)	0.306
Soda (Na_2O)	2.12
Lime (CaO)	47.50
Magnesia (MgO)	2.85
Iron and Alumnia (Fe & Al)	trace
Nitrogen (N)	0.054
Phosphorus pentoxide (P_2O_5)	0.123
Sulphur trioxide (SO_3)	0.37
Chlorine (Cl)	2.97
Silica (SiO_2)	3.22
Carbon dioxide (CO_2)	40.48
	99.993

Organic Deposits.

Throughout the Bahama Islands coral polyps are actively engaged in building up fringing reefs against the shore, while coral heads in both isolated and small clusters are scattered promiscuously over the more sheltered banks. As these were discussed in a previous section, they will not be taken up further in this place. There is, however, on the little island of Green Cay, situated on the southeast margin of Tongue-of-the-Ocean, a dead reef which lies permanently above the level of low tide. This reef, which extends along the shore for about a quarter of a mile, is composed of a number of different species of corals and extends in toward the center of the Island, where it becomes

covered by sand dunes. (Plate VIII.) It is the only instance of the kind which was discovered in the Bahamas, but it is evident that when this reef was formed it occupied a lower level than at present, and that it has been raised to its present position since its formation.

Structure and Age.

Nowhere were these sedimentary beds observed to lie otherwise than in a horizontal position. Cross-bedding due to wave and atmospheric action was, of course, prevalent, but this did not interfere with the general horizontal attitude of the deposits. Although the marine beds have been elevated since their deposition, they now occupy a position a few feet above and parallel to the one in which they were laid down. From the fossil contents of both the æolian and aqueous beds, Dr. Dall has determined that the deposits are Recent.

Erosion.

Signs of erosion are visible on every side throughout the Bahama Islands. In fact, it is evident that processes of destruction are much more important here than those of construction. The upper surface of the limestone rock out of which the Bahamas are built shows everywhere signs of solution. The solving agents are both carbon dioxide brought down by the rain from the atmosphere, or humic acids contained in the soil. Wherever these reagents attack the rock a differential erosion takes place, the softer parts are dissolved and carried away, leaving irregular cavities which in time fill with soil and form the pot-holes mentioned above. In other places where the solution has not advanced so far, a rubbly or rough surface is the result. These results, however, are insignificant when compared to the more important work of underground waters which during some period in the past, when the region stood higher than to-day, dissolved the subterranean rocks of the Islands and left them in a cavernous and honey-combed condition. The ocean-holes, banana-holes, and many of the brackish pools mentioned above are due to this subterranean solution.

As there are no true rivers in the Bahama Islands the mechanical erosion is practically confined to the work of waves. The Islands situated as they are, well out in the Atlantic are subjected to a perpetual attack from the sea. A glance at the map (Plate X) will suffice to convince one that the whole archipelago has suffered severely from the effects of wave erosion. The Islands are being slowly worn away and broken up into keys and rocks and these in

turn are being planed down to submarine banks. (Plate II, Fig. 1, and Plate III.) In fact, the entire archipelago as it exists to-day is only a fraction of what it must have been in times gone by.

It must be remembered that the Bahama Islands are honey-combed with caverns and that these cavities give the waves an excellent chance to attack and tear the rock asunder. Evidences of this are seen on every hand. From the shore where precipitous bluffs come down to meet the waves, the former frequently contain huge caverns which have been carved out by the waves as they have enlarged smaller openings which originally occurred in the rocks. These are of very common occurrence along the sea-shore but "The Caves" (Plate IX, Fig. 2), seven miles west of Nassau, furnishes as good an example as any and at the same time is within easy reach. This cavern has been excavated in the face of an ancient sea-cliff which now stands two hundred feet or more back from the shore and five or ten feet above sea level. It is about 25 feet deep by 20 high, and leads into the heart of a hill in the rear. This cave probably existed first as a subterranean cavern, which was broken into and enlarged by the waves when the island stood somewhat lower than to-day. The cutting of the sea-cliff and the enlarging of the cavern was carried on at one and the same time. Glass Window, Eleuthera and Hole-in-the-Wall near Elbow Cay, Abaco, are other instances of wave work in original subterranean caverns. In these latter cases, however, the caverns have been eroded at both ends, leaving only a thin section in the middle. These elevated sea-cliffs, cut by an ancient erosion, are not uncommon in the Bahamas. Another good example of them beside one already mentioned, occurs on the east side of Andros just south of Morgans Bluffs. The topography indicates that they were cut by the waves and their position shows that the surface of the Islands stood 5 or 10 feet lower than now.

In the introduction of this chapter it was stated that the Bahama Islands were located in the midst of the hurricane area of the West Indies. This fact will be more fully appreciated by an examination of Plates XVIII-XXIV, which show the tracks of hurricanes in the Bahamas since 1878. During ordinary storms the waves from the Atlantic roll in unchecked to break on the unprotected shores of the Bahamas, but these breakers are as nothing compared to the tremendous seas which are hurled against the Islands during hurricanes. In many places, particularly along exposed shores, immense blocks of limestone have been heaped into huge piles well up on the shore beyond the reach of the ordinary storm breakers. A typical example of this

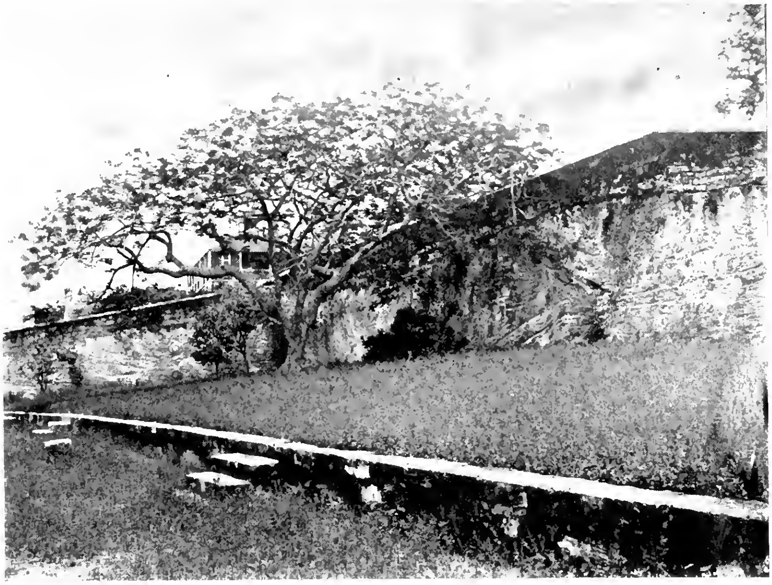

FIG. 1.—VIEW SHOWING CROSS-BEDDED STRUCTURE IN ÆOLIAN LIMESTONE AT NASSAU

FIG. 2.—NEARER VIEW OF CROSS-BEDDED STRUCTURE IN ÆOLIAN LIMESTONE AT NASSAU

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may be seen on Green Cay (Plate VI, Fig. 1, and Plate VII), near the elevated coral reef spoken of above. By an examination of these figures it will be seen that the thin-bedded coral rock in the foreground has been ripped up in huge slabs and piled in a rampart along the upper margin of the beach. An ancient one of these ramparts which have been recemented into solid rock by the accumulation and consolidation of coral sand is shown (Plate VI, Fig. 2).

TOPOGRAPHIC HISTORY.

It is stated above that the Bahama Islands are honey-combed with caverns. This could only have taken place when the Islands stood higher than they do to-day. Terrestrial and marine ocean-holes together with banana-holes and brackish-water lakes are different lines of evidence showing that the sea has ready access to the interior of the Islands. This access is easily possible through the presence of these underground caverns. The deepest ocean-holes extend down some 300 feet beneath the surface of the water. This indicates that the Islands must have stood at least 300 feet higher when this excavation took place than they do to-day. The present attitude of the archipelago then is indicative of subsidence. The evidence furnished by the elevated coral reef on Green Cay, together with the elevated deposits carrying marine shells and the raised sea-cliffs, shows that the Islands have been elevated from 10 to 25 feet at no very remote date.

So far as geological evidence is able to throw light on the problem, it is evident that the topographic history of the Islands has been as follows: there was a period of elevation when the Islands stood at least 300 feet higher than they do at the present time. During this epoch the dry land area of the Bahamas was very much greater than to-day. The extent of this land mass may be approximately reconstructed by imagining all the light-colored areas which now constitute the banks as standing above water level. (Plate X.) It will be seen then that the Islands as they exist to-day are mere remnants of what they were formerly and that the great reduction in land surface has been due to the effects of subsidence and marine erosion. During this period of elevation the limestone rock was dissolved into caverns and grottoes, similar to what exists now in the Shenandoah Valley and Florida. This period of elevation gave place to one of depression, when the land sunk beneath the level of the ocean to a position at least 15 feet lower than it now occupies. During this period the deposits bearing marine shells were made as well as the coral reef on Green Cay, and the ancient sea-cliffs were cut. The third chapter in the topographic

history opened when the Islands were elevated about 15 or 20 feet to their present position and brought up with them the marine deposits just mentioned.

It is not known whether the Islands at the present time are undergoing subsidence or elevation or whether they are stationary. In order to establish this point bench marks have been erected at Nassau which are described in full in another part of this volume. It will be interesting for future geologists to determine the position of these marks after a lapse of twenty-five or fifty years.

FOSSILS OF THE BAHAMA ISLANDS. WITH A LIST OF THE NON-MARINE MOLLUSKS

FOSSILS OF THE BAHAMA ISLANDS, WITH A LIST OF THE NON-MARINE MOLLUSKS

BY

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INTRODUCTION.

The material submitted to me by Dr. George B. Shattuck was chiefly collected by Dr. B. L. Miller, of Bryn Mawr College, and comprised specimens of the various calcareous rocks containing organic remains, as well as some fossils which had been removed from their associated matrix, all fully labelled with locality and other data.

The rocks may be divided into two general groups, those which were formed in water, or sedimentary; and those formed of drifted sands more or less consolidated, or æolian.

In the main the fossils of the sedimentary rocks are of marine origin while those of the æolian rocks are landshells, but in both there is some mixture, as dead marine shells from the beaches were included in the æolian sands, or landshells washed or blown into the sea in the sedimentary beds, as happens daily under present conditions.

All the material of both kinds of rock is ultimately organic or has been derived from the sea water through the medium of organisms which have secreted it in solid form, which has subsequently been reduced to sand by attrition and reconsolidated by partial resolution and deposition. In a broad sense this applies to both lime and silica as contained in these rocks, and more or less mingled with phosphoric acid and oxides of manganese or iron, of which the proportions in general are very small.

It is probable that the amount of sand derived from crystalline rocks of the adjacent region, except in the form of floating pumice, is almost infinitesimal.

The fundamental rock of the Bahamas is sedimentary and was deposited at a moderate depth below the sea at a very recent geological epoch, all the

marine fossils contained in it being now found living in the same region, at moderate depths. The terrestrial forms have invaded the Islands since their elevation above the sea level, and the æolian rocks have also been formed since that event. They contain the remains of the first forms which occupied the recently elevated territory as well as those which by evolution and variation have been developed since. Hence if we could form some estimate of the definite time which has elapsed since the elevation of the Bahamas, we should have a measure of the rate of variation and specific evolution of the landshells referred to, under favorable conditions.

It is hardly necessary to say that the data are yet quite insufficient to do more than point the way toward the solution of this problem, but to the fact that they do furnish some indications in this direction is due whatever interest the fossils herein noticed may possess.

The first evidence of the existence of extinct species of landshells in the æolian rocks of the Bahamas was given by the writer in the Bulletin of the Museum of Comparative Zoology, Vol. XXV, No. 9, in 1894, in discussing some collections made by Professor Alexander Agassiz during the voyage of the yacht *Wild Duck*.

The present collection adds considerably to our knowledge of these forms, and it may be supposed that further exploration would reveal other additions to the list.

LIST OF STATIONS AND THE SPECIES COLLECTED AT EACH OF THEM.

STATION 1.—About two miles north of Governors Harbor, Eleuthera Island, about six feet above the water, near the shore.

Cerion (*sp.*).
Phacoides (*Here*) *pensylvanicus* Linné.

STATION 2.—Fossils from the Mount Vernon estate, about four miles east of Nassau, N. P., in the walls of the sink-holes described in Note No. 8.

Arca (*Scapharca*) *transversa* Say.
Chama (*sp.*) fragment.
Phacoides (*Here*) *pensylvanicus* Linné.
Cerithium (*sp.*) fragment.
Torinia canalifera C. B. Adams.
Fissurella listeri Orbigny.

STATION 3.—Hard limerock from basement of Rum Cay.

Chama (*sp.*).
Phacoides (*Here*) *pensylvanicus* Linné.
Livona pica Linné.
Agaricia (*sp.*).

FIG. 1.—VIEW OF HAROLD POND, NEW PROVIDENCE, A TYPICAL BRACKISH WATER LAKE

FIG. 2.—VIEW OF GREAT LAKE, WATLINGS ISLAND, WITH FOAM BLOWN IN HEAPS ON THE BEACH

PHYSIOGRAPHIC AND GEOLOGIC VIEWS

STATION 4.—Hard rock containing fossils from inland not far from Clarence Harbor, Long Island.

Strombus gigas Linné.
Natica canrena Lamarck.
Bulla striata Bruguière.
Phacoides (*Here*) *pensylvanicus* Linné.
Hemicardium (*sp.*).

STATION 5.—Hard rock from Mangrove Cay, Andros Island.

Porites (*sp.*).
Phacoides (*Here*) *pensylvanicus* Linné.

STATION 5A.—Sink-hole in hill back of the town about half a mile inland and about thirty-five feet above sea level.

Favia (*sp.*).

STATION 6.—Hard rock from 30 to 35 feet above the sea level, in the wall of "Glass Window," Eleuthera Island. Landshells.

Cepolis varians Menke.
Cerion (near *cincrea* Maynard).

STATION 7.—From shores of small salt pan or lake, about two miles west of Clarence Harbor, Long Island.

Cerion (*sp.*).
Cerithium (*Pyrazus*) *septemstriatum* Say, *vars.*
Anomalocardia cuneimeris Conrad.

STATION 8.—Rock (very hard) from wall of large sink-hole on Mount Vernon estate, New Providence, about four miles east of Nassau.

Contains no recognizable fossils.

STATION 9.—Soft windblown sand rock from the quarry at the top of Nassau ridge, on Nassau street, New Providence.

Cerion (*sp.*) fragments.
Cepolis (*sp.*) fragments.

STATION 10.—Soft, fine-grained limerock from quarry near seawall, Glenely settlement, Tarpum Bay.

Phacoides (*Here*) *pensylvanicus* Linné.
Hemicardium (*sp.*) young.
Chione cancellata Linné.
Anomalocardia (*sp.*) young shell.

STATION 11.—Hard rock from basement of Rum Cay, material rather gravelly than sandy.

Codakia orbicularis Linné.
Hemicardium (*sp.*) young valve.

STATION 12.—Hard rock broken off the high cliff on the west side of New Providence Island. This specimen was obtained from about 15 feet above sea level.

Worn fragments of *Cypræa (cinerea?)*, *Chama*, *Phacoides*, etc., in a shell gravel compactly consolidated.

STATION 13.—Soft calcareous sand rock, a few feet above sea level, at east side of Corie Sound.

Phacoides (Here) pensylvanicus Linné.

STATION 14.—Soft calcareous sand of small unnamed key south of Reids Cay, Middle Bight, Andros Island. The material seems to be water-deposited. The shells are loose, some were found near the beach, others in the marl. None were found living. The shells are a mixture of land and marine species.

Truncatella sp. fragment.
Cepolis duclosiana Férussac.
Cerion rhyssum, new species, allied to *C. dimidiatum* Pfr.
Cerion ritchiei grayi Maynard.
Cerion glans Küster.
Chione cancellata Linné.
Cerithium sp.
Natica canrena Lamarck.
Nerita versicolor Lamarck.
Spirula australis (Lam.) Pelseneer.

STATION 15.—Fossils from soft sand rock in quarry on Nassau street at top of Nassau ridge; New Providence Island (see also No. 9).

Cerion agassizii Dall (extinct).
Cepolis troscheli Pfeiffer.
Cerithium sp. (worn).

STATION 16.—Fossils obtained from a soft sand rock about five feet above sea level. This rock contains large masses of coral, some two or three feet in diameter, and is exposed about three-quarters of a mile from the extreme east end of New Providence along the north shore.

Ostrea parasitica Gmelin.
Margaritiphora radiata Leach.
Lithophaga antillarum Orbigny.
Arca occidentalis Philippi.
Barbatia candida Gmelin.
Barbatia reticulata Gmelin.
Codakia orbicularis Linné.
Chama (macerophylla Chemnitz?) fragment.
Macrocallista nebulosa Solander.
Tellina radiata Linné.
Cypræa cinerea Linné.
Astralium imbricatum Gmelin.
Meandrites sp. ind.

STATION 17.—Fossils from quarry at back of hospital grounds, Nassau, New Providence. At the base of the section is a hard white rock from which was obtained—

Margaritiphora radiata Leach (Marine). Above this was a somewhat brownish, poorly cemented, sandy layer two or three feet thick, containing an extinct land shell, *Cerion agassizii* Dall. Above the sandy layer there is a hard white rock, containing no fossils.

STATION 18.—Fossils from the narrow part of Eleuthera Island opposite Savanna Sound from about five feet above sea level. The rock appeared to be a beach formation.

Cerion (near *agassizii* Dall) fragments.
Mytilus exustus Linné.
Phacoides (*Here*) *pensylvanicus* Linné.
Phacoides (*Callucina*) *radians* Conrad.
Phacoides (*Cavilucina*) *trisulcatus* Conrad.
Bulla striata Bruguière.
Natica canrena Lamarck.
Acmæa punctulata Gmelin.
Balanus sp. fragments.

STATION 19.—Fossils from æolian rocks along east side Rum Cay.

Cerion lentiginosum Maynard.
Cepolis varians Menke.
Cepolis agassizii new species, near *varians*, Menke.
Cepolis pharcida new species, near *duclosiana* Férussac.
Helicina rawsoni Pfeiffer (Watlings Id.).
Barbatia sp.
Chama sp. indet., worn.
Tectarius (*muricatus*? L.) worn shell.
Livona pica Linné.
Claw of a small crab.

STATION 20.—Fine, rather hard, gravelly sand rock, with included worn calcareous pebbles, from about one mile north of Pigeon Hill, Eleuthera Island, and about one mile inland.

Mytilus exustus Linné.
Lampusia sp. (fragment).
Chlorostoma sp. (young shell).

STATION 21.—Bluff of Eleuthera Island about a mile north of Bluff settlement and six feet above sea level. Above the rock containing these fossils is a stratum of rock of æolian origin. The matrix of the fossils is a soft, fine, calcareous sand rock.

Glycymeris americana Defrance.
Phacoides (*Here*) *pensylvanicus* Linné.
Cerithium floridanum Mörch.

STATION 22.—Æolian sand rock, one hundred yards north of "Glass Window," Eleuthera Island, at about three feet above sea level.

Cerion alta Maynard.

STATION 23.—Fine, rather soft, sand rock from near Clarence Harbor, Long Island, about three-quarters of a mile inland.

Mytilus exustus Linné.
Divaricella quadrisulcata Orbigny.
Bulla striata Bruguière.
Mangilia sp. (fragment).
Olivella nivea Gmelin?
Trivia pediculus Linné.
Litorina sp. (young shell).
Bittium varium Pfeiffer.

STATION 24.—Basement rock of Rum Cay. Same as Station 3. Hard water-laid sand rock with numerous shell fragments and worn calcareous pebbles.

Strombus gigas Linné.
Murex nuceus? Mörch.
Nassa ambigua Montagu.
Pyrula papyratia Say, fragment.
Arca umbonata Lamarck.
Mytilus exustus Linné.
Balanus sp. fragments.
Meandrites sp. worn.

STATION 25.—See Station 2.

STATION 26.—Hard, fine gravel rock from Arthurs Town, Cat Island, about half a mile inland.

Glycymeris americana Defrance.
Cardita (Glans) dominguensis Orbigny.

STATION 27.—Fossils from above "Glass Window." Eleuthera Island. See also Station 6.

Cerion blandi Pilsbry and Vanatta.
Cepolis varians Menke.

STATION 28.—Fossils from three and a half miles N. W. of Clarence Harbor, Long Island, and half-way across the island.

Arca sp. fragment.
Codakia orbicularis Linné.
Phacoides (Here) pensylvanicus Linné.
Phacoides (Lucinisca) nassula Conrad.
Chione cancellata Linné.
Columbella mercatoria Linné.
Mitra sp. fragment.

Nassa ambigua Montagu.
Trivia pediculus Linné.
Polynices lactea Guilding.
Natica canrena Lamarck.
Cerithium algicola Adams.
Cerithium semiferrugineum Lamarck.
Bulla striata Bruguière.

STATION 29.—Stratified rock along shore of Green Cay, a hard, calcareous sand rock.

Phacoides (Here) pensylvanicus Linné.
Chama variegata Reeve.
Nerita tessellata Gmelin.

STATION 30.—Rock in place about one and a half mile west of "The Caves," New Providence, and about five feet above sea level.

Arca reticulata Gmelin.
Chama sarda Reeve.
Phacoides (Here) pensylvanicus Linné.
Strigilla carnaria Linné.
Purpura sp., fragment.
Natica castrensis Dall.

THE LANDSHELL FAUNA OF THE BAHAMA ISLANDS.

The latest enumeration of the recent landshell fauna of the Bahamas which has come to my notice is the list given by Mr. Bendall in 1895 in the Proceedings of the Malacological Society of London. This list contains at least two synonyms and several names of species which have been mistakenly attributed to the Bahamas, and six varieties of recognized species. Deduction being made of these, there remains a total of seventy-six species then known to inhabit the Islands.

To these are now added, for the purpose of making a complete enumeration of the known land and fresh-water fauna of the Bahamas, (1) a number of species in the collection of the U. S. National Museum, derived from various sources; (2) a certain number of species first collected by Mr. Owen Bryant, of Boston, on a recent trip to the Bahamas, the report on which, by the writer, will shortly be printed; and (3) the species collected by the present Expedition, and described in the text here following, preceding the general list of the fauna.

The list now given comprises 172 forms, of which 25 may be regarded as varietal, leaving 147 recognized species so far as at present known, adding seventy-one species to the list of 1895. In view of the great variability of the genus *Cerion*, only those forms which seemed well characterized have been

admitted as of specific rank; fully as many more could be added if all those hitherto described were enumerated. I have no doubt that a large number of well-characterized new forms will be added to the catalogue of those now known, when the various islets are all thoroughly and systematically explored.

Of the well-established species of the existing fauna a certain number seem to have been lately introduced from Cuba or the adjacent region. These naturalized members of the fauna include the species of *Oleacina, Pleurodonte, Orthostyla* and *Urocoptis*, and one of the species of *Bulimulus*. The chief and most conspicuous elements of the strictly indigenous landshell population are the species of the genus *Cepolis* and of the genus *Cerion*, which together make up nearly half the existing fauna. Eight *Helicinidæ* and nine *Cyclostomatidæ* are next in importance in the census. Remaining types are represented usually by only one or two species each.

The genera *Cepolis* and *Cerion* take their origin from the Oligocene period. During the Middle Oligocene the peninsular part of Florida was represented by a group of islets which must have greatly resembled the Bahamas of to-day. They were low with occasional lakes of fresh water, and generalized forms of *Cepolis* and *Cerion* made up the bulk of their landshell fauna, in which *Helicina, Bulimulus, Urocoptis* and *Polygyra* were represented, as well as *Planorbis* and *Lioplax*. So far as the scanty remains in the Bowden marl of nearly the same geological age afford evidence, the characteristics of the Floridian island fauna and that of Jamaica were as different as they are to-day, the fossils found having nothing in common.

The present landshell fauna of south Florida is apparently not directly derived from this Oligocene assemblage, of which the more tropical types may have been eliminated during the comparatively cold Miocene epoch; but the similarity to the present Bahama fauna is sufficiently striking to suggest that the latter is the recent representative of the former.

This representation does not proceed from a lineal succession on the spot, for it is probable that the entire archipelago of the Bahamas may have been submerged during comparatively recent geological time. The islands of which it is composed are so low that their submergence during the changes of level which are known to have taken place in the adjacent high islands of Cuba, Haiti, etc., must have been almost inevitable. We are led to believe that the types which existed in Florida also were represented in Cuba, which

FIG. 1.—VIEW SHOWING THIN-BEDDED LIMESTONE, GREEN CAY

FIG. 2.—VIEW SHOWING A RECEMENTED BOULDER RAMPART, GREEN CAY

PHYSIOGRAPHIC AND GEOLOGIC VIEWS

has never been entirely submerged since the Eocene epoch, by which exemption they were preserved to again spread out over the Bahamas when their elevation again rendered them suitable for colonization. That this was comparatively recent is rendered probable by the extreme variability of the species now occupying the Bahamas and which are frequently connected by intergrading forms, suggesting that the elimination which would be brought about in the course of time by natural selection and other factors, has not yet had time to complete its work of restricting the specific forms.

This immigration took place from Haiti and Cuba, judging by the analogies of the fauna, but the marked similarity to the Florida Oligocene fauna is due not only to the presence of representative types but to the absence of a multitude of others which are very characteristic of either Haiti or Cuba. This is to be accounted for by the similarity of the environment. The types represented in the Bahamas, as formerly in Florida, are lowland forms, which for the most part affect the vicinity of the sea. These would be the first to be transferred to the new land and would find it congenial, while the species of the higher land and moister forests of Cuba and Haiti would be transferred much less readily, and, if successfully transplanted, would find the conditions of existence much less favorable.

With the opportunity for occupying a favorable district in which there were no competing organisms we find, as in insular faunas generally, a great increase in variability, the development of a multitude of slightly varying types, and the greatest profusion of individuals.

To this is due the fact that in Cuba and Haiti, from which the immigrants came, the number of species of their type now living is much less in proportion to the total fauna than in the Bahamas. *Cerion* and *Cepolis* form about half the species of the Bahama landshell fauna, while in Cuba and Haiti these two genera form an insignificant percentage of the molluscan population.

Another feature which confirms the view above stated is the fact that several of the fossil species of the Bahamas more nearly resemble some of those now living in Cuba or Haiti than they do the prevalent Bahama living forms; or, at best, are intermediate between them.

The landshells obtained by the Bahama Expedition in a fossil state are the following species:

CEPOLIS (HEMITROCHUS) VARIANS Menke.

Helix varians Menke, 1829, Cat. Coll. Malsburg, p. 5; Conch. Cab. ed. II, *Helix*, pl. 109, figs. 1-5.
Helix (*Helicella*) *carnicolor* (Férussac) Pfeiffer, 1840, Symb. ad. hist. Hel., p. 37.
Hemitrochus hæmastomus Swainson, 1840, Malac., p. 165.

Fossil, above "Glass Window," Eleuthera Island, Stations 6 and 27; east side Rum Cay in æolian rocks at Station 19. Living at Nassau, Rum Cay and Rock Island, Bahamas; Florida Keys, Cuba, etc.

This species represented in the æolian rock by a number of specimens and fragments, does not appear to differ from the recent shell except in its loss of color.

CEPOLIS (HEMITROCHUS) AGASSIZII n. sp.

Plate XII, Fig. 8.

Fossil at Station 19, in æolian rock on the east side of Rum Cay.

Shell resembling *C. varians* Menke, but larger, thinner, and with more inflated whorls; whorls about five and a half, turgid, with an appressed but distinct suture; sculpture of rather strong more or less irregular incremental lines, more prominent on the spire; surface polished, color white with two dark bands between the sutures on the spire and, on the last whorl, three, rather broad with narrower interspaces, the most anterior of which is peripheral; the base is white; aperture much as in *C. varians*, the lower and pillar lips reflected over but (in the type shell, not quite mature) not closing a minute perforation in the umbilical region. Height 20.2, max. diameter 18, min. diameter 16 mm.

A single partly defective specimen of this species was obtained. It is larger than any of the known living species of *Hemitrochus* and so characteristic that I felt warranted in naming it after Prof. Alex. Agassiz, whose studies of the Bahamas have been so extensive.

CEPOLIS (PLAGIOPTYCHA) INAGUANA variety SUBANDROSI Dall, nov.

Fossil on small unnamed key south of Reids Cay, Middle Bight, Andros Island, at Station 14.

Shell like *C. inaguana* Dall, but larger, with the pillar-lip broader and with traces of a narrow dark band just behind the suture at the aperture; behind this a subequal pale band, and behind the latter a broad band, more or less dark, extending to the next suture. Height 7.5; max. diameter 12.0; min. diameter 9.25 mm.

A single specimen was found as above.

CEPOLIS (HEMITROCHUS) TROSCHELI Pfeiffer.

Helix troscheli Pfeiffer, 1846, Symb. ad. hist. Hel., III, p. 76; Conch. Cab. ed. II, *Helix*, pl. 109, figs. 6-11.

Fossil in the quarry of æolian rock on top of Nassau ridge, Nassau, New Providence Island, at Station 15. Living at New Providence, Gun Cay and Inagua Island.

This species agrees well with the recent shell with which we have identified it.

CEPOLIS (PLAGIOPTYCHA) PHARCIDA n. sp.

Plate XII, Figs. 2, 3.

Fossil at Station 19, in æolian rock on the east side of Rum Cay.

Shell depressed, thin, originally yellowish with a pale peripheral band, five whorled; spire depressed conic, whorls above slightly convex with a well-marked suture; nuclear whorls smooth, polished, later ones with fine, close threadlike sculpture following the incremental lines; periphery of the last whorl a little above the middle of the whorl and slightly prominent though rounded; base rounded, umbilicus small, deep; termination of the adult last whorl bent down, constricted, then expanded and below a little reflected, broad at the very short pillar, narrow above, with a fold or ridge projecting into the lumen of the whorl behind and parallel with the basal lip; the plane of the aperture forming an angle of about 45° with the vertical axis of the shell. Height 10, major diameter 19, minor diameter 15.5 mm.

This species is nearest to *C. gregoriana* Dall. Than *C. duclosiana* it is smaller, smoother, more polished and with the gular fold shorter, higher, and more obliquely set with regard to the lip in front of it. The sculpture of the present species is more like that of the Haitian *Cepolis* than that of most of the living Bahama *Plagioptycha*. The fossil species is the largest of the group to which it belongs, and recalls the Oligocene *Cepolis instrumosa* Dall, of the Tampa, Florida, silex beds, more than any of the recent species.

CERION (STROPHIOPS) AGASSIZII Dall.

Plate XII, Fig. 5.

Cerion (Maynardia) agassizii Dall, 1894, Bull. Mus. Comp. Zool., XXV, No. 9, p. 120, figs. 9, 10.

Fossil in the æolian rock of the quarry at the top of Nassau ridge, Nassau, N. P., at Stations 9 and 15, and in the quarry back of the hospital grounds, Nassau, at Station 17.

This is a large, heavy, variable species with a peculiar thick duplex sharp-edged lip. The shell varies from nearly smooth to rather finely and closely rib-striate. An imperfectly preserved form resembling this species was obtained from the narrow part of Eleuthera Island, opposite Savanna Sound, at Station 18, and another on the same island about two miles north of Governors Harbor, at Station 1.

Cerion (Strophiops) rhyssum n. sp.

Plate XII, Figs. 4, 6.

Fossil in the æolian rock of a small unnamed key south of Reids Cay, Middle Bight, Andros Island, at Station 14.

Shell large, heavy, solid, with a short parietal tooth, the axial tooth absent or obsolete; axis a hollow cylinder with a small umbilical perforation in the adult; whorls 10-11, the nepionic whorls at first smooth and polished, then delicately axially striated; form cylindrical with a short apical cone, sometimes much depressed; sculpture of the adult whorls of about 17 rather sharp, slightly oblique ribs, with wider interspaces, the basal whorl attenuated and more finely wrinkled axially below; there is no basal cord or spiral striation; peristome slightly thickened and continuous. The color is, of course, grayish white with traces of brown in the throat. Measurements of the two most contrasted specimens, in millimeters are:

Height.	Max Diameter.	Height of last whorl.
33	16.0	17
26	17.5	16

This species belongs to Maynard's section *Pinguitia* and seems most closely related to *C. dimidiatum* Pfr., of which the short form is *C. proteus* Gundlach; a Cuban species found at Gibara.

Cerion (Strophiops) grayi Maynard.

Strophia grayi Maynard, 1894, Contr. to Science, II, p. 138, figs. 42, 43.
Strophia ritchiei Maynard, 1894, op. cit. p. 135, fig. 41.
Cerion (Strophiops) ritchiei, form *grayi*, Pilsbry, 1902, Man. Conch., XIV, p. 250, pl. 39, figs. 93, 94, 98, 99.

Small unnamed key south of Reids Cay, Middle Bight, Andros Island, at Station 14. Living at Highborn Cay, Maynard.

This form is regarded by Dr. Pilsbry as a mutation of *C. ritchiei* which may perhaps be the case; I have retained the name *grayi*, however, as the specimens agree closely with the typical *grayi* while not so similar to the

form which was originally called *ritchiei*. The localities of the fossil and recent form are nearly abreast of each other, though some distance apart.

CERION (STROPHIOPS) GLANS Küster.

Pupa glans Küster, 1848, Conch. Cab. ed. II, p. 74, pl. 11, figs. 1, 2.
Cerion (Strophiops) glans Pilsbry, 1902, Man. Conch., XIV, p. 253, pl. 43, fig. 56.

Fossil at Station 14, Andros Group, with the last species; also by Agassiz on Andros and Great Stirrup Cay. Living on Andros, New Providence, and their associated cays and islets.

This agrees with the figure cited from the Manual of Conchology.

CERION (STROPHIOPS) BLANDI Pilsbry and Vanatta.

Cerion blandi Pilsbry and Vanatta, 1896, Proc. Acad. Nat. Sci. Phila., p. 334, pl. 11, fig. 7; Man. Conch., XIV, p. 263, pl. 44, fig. 81.

Fossil above "Glass Window," Eleuthera Island at Station 27. Living, Turks Island.

The specimens above identified have a great resemblance externally to several species from the south side of Cuba, as for instance *C. pannosum* Maynard, but the parietal tooth is short in the fossil and long in the Cuban forms. Without a large and well-preserved series it is almost hopeless to identify forms of this group, but the specimens obtained are admirably represented by the figure of *blandi* in the Manual.

CERION (STROPHIOPS) ELEUTHERÆ P. and V., var. DRUPIUM Dall, nov.

Cerion eleutheræ Pilsbry and Vanatta, 1896, Proc. Acad. Nat. Sci. Phila., p. 333, pl. 11, figs. 19, 20; Man. Conch., 1902, XIV, p. 240, pl. 36, fig. 38.

Fossil at Station 6, above "Glass Window," Eleuthera. Living, Eleuthera Island.

The shell above referred to has the cylindrical form of the *gubernatorium* group; though the lip is not fully complete it has the outline of *eleutheræ*, from which the form differs in having fine, close, feeble riblets over the whole shell.

CERION (STROPHIOPS) LENTIGINOSUM Maynard.

Strophia lentiginosa Maynard, 1889, Contr. to Science, I, p. 75, fig. 11, pl. 7, fig. 18.
Cerion lentiginosum Pilsbry, 1902, Man. Conch., XIV, p. 248, pl. 37, figs. 60, 61.

Fossil in æolian rocks on the east side of Rum Cay, at Station 19. Living on the west side of Rum Cay, in the interior.

CERION (STROPHIOPS) MAYNARDI Pilsbry and Vanatta.

Strophia alta Maynard, MS. in Coll. U. S. N. M. ? = *Cerion maynardi* Pilsbry, Proc. Acad. Nat. Sci. Phila., 1895, p. 5.

Fossil with *C. eleuthera* var., above "Glass Window," Eleuthera Island, at Station 22. Living on Rum Cay, Maynard; Abaco, Pilsbry.

The fossil specimens agree closely with a specimen from Rum Cay, named for the U. S. National Museum by Mr. Maynard. It recalls *C. grayi* Maynard in its sculpture, but is smaller and more fusiform.

CERION sp. indet.

Specimens of *Cerion* too imperfect for identification were noted in calcareous rock collected at Station 1, on Eleuthera Island, and Station 7, on Long Cay.

HELICINA RAWSONI Pfeiffer.

Plate XIII, Figs. 1, 3.

Helicina rawsoni Pfr., 1867, Malak. Blatt., XIV, p. 165. *Ibid.*, 1876, Mon. Auric. pt. II, p. 261, Dall, 1894, Bull. Mus. Comp. Zool., XXV, No. 9, p. 118.

Fossil in æolian rock on the east side of Rum Cay. Living on the island of Inagua (type locality) and Watlings Island. This species until now has not been figured.

TRUNCATELLA sp. indet.

The decollate tip of a species of *Truncatella* was obtained at Station 11, on a small unnamed key, south of Reids Cay in the Middle Bight of Andros Island.

As there seems to be no recent list of the Bahama landshells in which the distribution according to the several islands is noted, the following catalogue has been carefully compiled from the literature and from the material preserved in the collections of the U. S. National Museum. Varieties for the most part are omitted, as to include them would have greatly expanded the list without any obvious benefit. Note has been made of synonymic deductions from previous lists, and nearly all species not positively known to inhabit the Bahamas have been excluded.

In examining the collection to make sure of getting all the species represented in it from the Bahamas, several forms were found which appeared to be undescribed or incorrectly identified with Cuban or Haitian species. Descriptions of these follow in order that they may be included in the list.

FIG. 1.—VIEW SHOWING BOULDER RAMPART, GREEN CAY

FIG. 2.—NEARER VIEW OF BOULDER RAMPART

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Cepolis (Hemitrochus) exumana n. sp.

Plate XIII, Figs. 4, 7.

Shell small, solid, turbinate, with five moderately convex whorls, evenly rounded at the periphery; nuclear whorls polished, translucent, usually dark brown or darker than the rest of the shell; sculpture of fine, small, sharp riblets, in harmony with the lines of growth, with equal or wider interspaces, and less evident on the last whorl; color very variable, sometimes unicolor, from creamy white to dark brown without bands; other specimens are banded with brown on a creamy ground, generally darker above, lighter below, and with a dark brown narrow peripheral band above a narrow white one; some are brown with a peripheral and a subsutural narrow white band, or numerously banded on a lighter ground, or with the bands broken up into delicate pencillings; the last whorl descends slightly at the aperture, which is quite rounded, with a strong reflected peritreme, whitish or bright rose pink; the lip is reflected over and nearly closes the umbilicus; there is little callus on the body, no gular fold, and the throat is usually dark colored. Height 10, max. diameter 12.5, min. diameter 11 mm.

This pretty species was collected on Exuma Island by Dr. J. J. Brown. It is nearest to *C. penicillata*, Gould (not Poey) from Matanzas, Cuba, which is a less solid, slightly larger shell with a lump on the basal side of the aperture when fully mature, while the present species has no trace of any gular fold. Types 37668-9, U. S. National Museum.

Cepolis (Plagioptycha) gregoriana n. sp.

Plate XIII, Figs. 5, 8.

Shell depressed with four and a half whorls, a strongly marked suture, and narrowly perforate umbilicus; periphery evenly rounded, often marked by a narrow pale band; sculpture, following a smooth nucleus, of numerous, sharp, low close-set riblets, in harmony with the lines of growth, separated by slightly wider interspaces and evenly covering the whole shell; the surface is dull, not polished, and the color a more or less pronounced reddish brown; the last whorl near its termination is sharply constricted and depressed, its margin expanded and below slightly reflected, especially over the umbilicus, but above simple and sharp; a prominent white gular fold is set obliquely within the aperture, which is very oblique; aperture oval, with a thin callus on the body. Height 7, max. diameter 15, min. diameter 11.5 mm.

Collected by Messrs. Bean and Riley of the U. S. National Museum, at Gregorytown, Eleuthera Island. Types No. 173183, U. S. National Museum.

This species is more like the fossil form from Rum Cay (*C. pharcidum* Dall) than any of the known living species but is much smaller, more sharply sculptured, and has the gular fold shorter, more oblique, and relatively more prominent. It is notable for its dull, unpolished surface, which presents a marked contrast to the polish of the *duclosiana* group.

CEPOLIS (PLAGIOPTYCHA) DUCLOSIANA variety COLUMBIANA Dall, nov.

Plate XIII, Figs. 6, 9.

Shell similar to *C. duclosiana* Férussac, but smaller, the apex proportionately more elevated and pointed; the number of whorls the same, but the gular fold lower, more elongated, less oblique, and closer to the pillar and lower lip. Height 7.5, max. diameter 14, min. diameter 12 mm.

Watlings Island, U. S. Fish Commission. Types No. 109416, U. S. National Museum.

CEPOLIS (PLAGIOPTYCHA) INAGUANA n. sp.

Plate XII, Fig. 1; Plate XIII, Fig. 2.

Shell small, subturbinate, with four and a half rounded whorls united by a strongly marked suture; spire moderately elevated, periphery evenly rounded, base moderately convex with a small perforate umbilicus nearly closed by a reflection of the pillar-lip; color olivaceous with a brilliantly polished periostracum; nucleus smooth, the remainder of the whorls sculptured with sharp, elevated lines with wider interspaces and oblique curvature, strongest on the earlier whorls but persistent over the whole shell; aperture depressed, oblique, the whorl behind it slightly constricted; upper and outer lips simple, thin; pillar-lip reflected over the umbilicus (which it does not quite close) and on the base; there is no indication of a gular fold. Height 7, max. diameter 10.5, min. diameter 8 mm.

Inagua Island, Bahamas, Lea Collection in the U. S. National Museum, No. 105793.

The most marked characteristic of this little shell, after its small size and sharp sculpture, is the entire absence of a gular fold. What appears to be a larger variety of this, with a broader pillar-lip and coloration of brown bands, was found in the fossil state at Station 11, in the Andros group and named *subandrosi*.

LIST OF BAHAMA LANDSHELLS.

(RECENT AND FOSSIL.)

NOTE.—N. P. = New Providence Id., chiefly in the vicinity of Nassau. Cat Island and San Salvador are regarded as identical in this list.

Oleacina solidula Pfr., New Providence, Great and Little Abaco, Andros Id.
Pleurodonte (*Zachrysia*) *provisoria* Pfr., N. P., Abaco.
Cepolis (*Hemitrochus*) *varians* Menke, N. P., Inagua, Crooked Id., Eleuthera, Rum Cay, Andros, Long Id., Abaco, Bahamas. Florida Keys.
Cepolis (*Hemitrochus*) *milleri* Pfr., Long Cay, Fortune Id.
Cepolis (*Hemitrochus*) *constantior* Weinland, Inagua, Rum Cay, Turks Id., Crooked Id., Long Id.
Cepolis (*Hemitrochus*) *caribæa* Weinland, Crooked Id., Eleuthera, Inagua.
Cepolis (*Hemitrochus*) *agassizii* Dall, fossil, Rum Cay.
Cepolis (*Hemitrochus*) *gallopavonis* Val., Turks Id., Watlings Id.
Cepolis gallopavonis var. caracaloides Pilsbry, Ambergris Cay, Turks Id. group.
Cepolis (*Hemitrochus*) *troscheli* Pfr., N. P., Gun Cay, Inagua.
Cepolis troscheli var. calacala Weinland, N. P., Great Inagua.
Cepolis troscheli var. browni Pilsbry, Cat Id.
Cepolis (*Hemitrochus*) *multifasciata* Weinl. and Marts., Crooked Id., Inagua.
Cepolis multifasciata var. polytæniata Pilsbry, Crooked Id.
Cepolis (*Hemitrochus*) *filicosta* Pfr., Eleuthera.
Cepolis (*Hemitrochus*) *maynardi* Pilsbry, Andros.
Cepolis (*Hemitrochus*) *xanthophaës* Pilsbry, Inagua, Long Id.
Cepolis (*Hemitrochus*) *exumana* Dall, N. P., Exuma Id.
Cepolis (*Plagioptycha*) *macroglossa* Pfr., Great Inagua.
Cepolis (*Plagioptycha*) *duclosiana* Fér., N. P.
Cepolis duclosiana var. salvatoris Pfr., Cat Id. (or San Salvador), Eleuthera.
Cepolis duclosiana var. columbiana Dall., Watlings Id.
Cepolis (*Plagioptycha*) *smirna* Dall, Riding Point, Grand Bahama.
Cepolis (*Plagioptycha*) *abacoensis* Martens, Abaco.
Cepolis (*Plagioptycha*) *inaguana* Dall, Inagua.
Cepolis inaguana var. subandrosi Dall, Andros group, fossil.
Cepolis (*Plagioptycha*) *gregoriana* Dall, Gregorytown, Eleuthera Id.
Cepolis (*Plagioptycha*) *pharcida* Dall, Rum Cay, fossil.
Cepolis (*Plagioptycha*) *bahamensis* Pfr., N. P.
Cepolis bahamensis var. holostoma Pilsbry, Turks Id.
Cepolis (*Plagioptycha*) *androsi* Dall, Mangrove and Golding Cays, South Bight of Andros group.
Cepolis (*Plagioptycha*) *sargenti* Bland, Little Inagua.
Cepolis (*Plagioptycha*) *indistincta* Fér., *var. disculus* Deshayes, Turks Id., Eleuthera.
Cepolis (*Plagioptycha*) *albersiana* Pfr., Great Inagua, Haiti.
Cepolis (*Eurycampta*) *bryanti* Pfr., Water Cay, Ragged Id.
Thysanophora saxicola Pfr., N. P., Cuba at Matanzas; Haiti.
Thysanophora (*vortex var.?*) *inaguensis* Weinland, Little Inagua.
Thysanophora vortex Pfr., N. P.; Watlings Id.; Great Abaco; Mangrove Cay, Andros; also Florida, Bermuda, etc.
Thysanophora (*Ptychopatula*) *dioscoricola* C. B. Adams, N. P., also Jamaica, Florida, etc.
Polygyra cereolus Mühlfeldt, *var. microdonta* Deshayes, Watlings Id.; Great and Little Abaco; N. P.; Mangrove Cay, South Bight of Andros group.

Guppya gundlachi Pfr., N. P.; Watlings Id.; also Florida, etc.

Oxystyla undata Bruguière, N. P.; Andros; Trinidad, etc.

Microceramus gossei Pfr., *var. providentia* Pilsbry, Mangrove Cay, South Bight of Andros; N. P.; Little Abaco.

Microceramus swiftii Bland, Turks Id.; Inagua; Watlings Id.

Bulimulus (Bulimulus) sepulchralis Poey, N. P., at Nassau; Cuba, at Havana.

Bulimulus (Drymæus) bahamensis Pfr., N. P., Durham Creek, Great Inagua; Eleuthera; Mangrove Cay, Andros; Little Abaco; also Haiti.

Bulimulus sp. indet., Watlings Id.

Urocoptis (Gongylostoma) bahamensis Pfr., Nassau.

Urocoptis bahamensis var. providentia Pilsbry, Mangrove Cay, South Bight of Andros; Nassau, N. P.

Cerion (Strophiops) incanum Binney, Gun Cay; also Florida Keys.

Cerion (Strophiops) incanoide Pilsbry and Vanatta, Turks Id.

Cerion (Strophiops) stevensoni Dall, Rum Cay (not Long Id.).

Cerion (Strophiops) felis Pilsbry and Vanatta, Cat Id.

Cerion (Strophiops) sculptum Poey (Loc.?).

Cerion (Strophiops) regina Pilsbry and Vanatta, Turks Island, with many varieties.

Cerion (Strophiops) calcareum Pfr., Little Inagua.

Cerion (Strophiops) sarcostomum Pilsbry and Vanatta, Little Inagua.

Cerion (Strophiops) columna Pilsbry and Vanatta, Turtle Cove, Great Inagua.

Cerion (Strophiops) regium Benson, Castle Island, on Crooked Island bank.

Cerion (Strophiops) weinlandi Kurr, Crooked Island.

Cerion (Strophiops) nudum Maynard, Clarence Harbor, Long Island.

Cerion (Strophiops) brunneum Dall, Governors Harbor, Eleuthera.

Cerion (Strophiops) variabile Dall, Red Bay, Northwest point of Andros Id.

Cerion (Strophiops) variabile var. saurodon Dall, Red Bay, Andros Id.

Cerion (Strophiops) variabile var. pupilla Dall, Red Bay, Andros Id.

Cerion (Strophiops) inflatum Maynard, Salena Point, Acklin Id.

Cerion (Strophiops) plegmatum Dall, Exuma.

Cerion (Strophiops) rhyssum Dall, Andros group (fossil).

Cerion (Strophiops) gubernatorium Crosse, Nassau, N. P.

Cerion (Strophiops) agassizii Dall, N. P. (fossil).

Cerion (Strophiops) milleri Pfr., Duck Cay, Exuma group.

Cerion (Strophiops) northropi Dall, Bahamas (probably near Gun Cay).

Cerion (Strophiops) pillsburyi Pilsbry and Vanatta, Gun Cay.

Cerion (Strophiops) niteloide Dall, Water Cay, Salt Cay bank.

Cerion (Strophiops) abacoense Pilsbry and Vanatta, Abaco.

Cerion (Strophiops) maynardi Pilsbry and Vanatta, Abaco. Fossil at Glass Window, Eleuthera.

Cerion (Strophiops) album Maynard, west coast of Rum Cay, near the salt pond.

Cerion (Strophiops) browni Maynard, north side of Rum Cay.

Cerion (Strophiops) lentiginosum Maynard, interior west part of Rum Cay.

Cerion (Strophiops) ritchiei Maynard, Highborn Cay; Mangrove Cay, Andros Id.

Cerion (Strophiops) aff. ritchiei, Great Ragged Cay.

Cerion (Strophiops) ritchiei vannostrandi Pilsbry and Vanatta. (Loc.?)

Cerion (Strophiops) eburneum Maynard, U Cay, north of Highborn Cay.

Cerion (Strophiops) glans Küster, Andros Id., Gun Cay, N. P., and Great Ragged Cay.

Cerion glans obesum Dall, Long Cay in the North Bight and Mangrove Cay in the South Bight of Andros.

Cerion glans varium Bonnet, Nassau.
Cerion glans cinereum Maynard, Ragged Cay, N. P., Gun Cay.
Cerion glans coryi Maynard, Nassau, near Fort Charlotte, and Egg Id., Eleuthera.
Cerion glans neglectum Maynard, Nassau, and Great Stirrup Cay.
Cerion glans griseum Maynard, near South Bight of Andros Id.
Cerion glans bimarginatum Maynard, Green Cay and Little Golding Cay, Andros.
Cerion (Strophiops) maynardi Pilsbry and Vanatta, Rum Cay, Eleuthera.
Cerion (Strophiops) blandi Pilsbry and Vanatta, Turks Island. Fossil at Glass Window, Eleuthera.
Cerion (Strophiops) eximium Maynard, Cat Id., Nassau, N. P.
Cerion (Strophiops) eximium fraternum Pilsbry, Cat Island.
Cerion (Strophiops) agrestinum Maynard, south side of New Providence Id.
Cerion (Strophiops) oweni Dall, Indian Hole, Little Abaco; Sugarloaves, and also the south side of Great Abaco opposite Marsh Harbor; Grand Bahama.
Cerion oweni incisum Dall, Sweeting's village and Stranger Cay, Abaco.
Cerion oweni vermiculum Dall, Mathews Point, west side Great Abaco.
Cerion (Strophiops) bendalli Pilsbry and Vanatta, Abaco.
Cerion (Strophiops) martensi Weinland, Crooked Island.
Cerion (Strophiops) multistriatum Pilsbry and Vanatta, Crooked Island.
Cerion (Strophiops) marmoratum Pfr., Fortune Id.
Cerion (Strophiops) fordii Pilsbry and Vanatta, Bahamas (Andros?).
Cerion (Diacerion) bryanti Pfr., southern part of Inagua.
Cerion (Diacerion) rubicundum Menke, northwest point and eastern end of Inagua Island.
Cerion (Diacerion) heterodon Pilsbry, Inagua.
Cerion (Diacerion) dalli Maynard, Inagua.
Cerion (Diacerion) duplodon Pilsbry and Vanatta, Bahamas. (Inagua group?)
Strobilops hubbardi Brown, Watlings Id., also Florida, etc.
Pupoides marginatus Say, *var. modicus* Gould, Andros, Nassau, Turks Id. Also Haiti, Bermuda, Florida.
Bifidaria servilis Gould, Andros: N. P.; Watlings Id., Turks Id.; also Jamaica, Bermuda, etc.
Vertigo ovata Say, Mangrove Cay, Andros; also Cuba, Florida, etc.
Subulina octona Bruguière, N. P., Antilles generally.
Opeas octonoidea C. B. Adams, N. P.; Mangrove Cay, Andros.
Opeas subula Pfr., N. P., Great Abaco; Great Inagua; Haiti; Key West, Florida.
Opeas micra Orbigny, N. P.; also South America.
Opeas paupercula C. B. Adams, Mangrove Cay, Andros; Nassau; Jamaica.
Lamellaxis pallidus C. B. Adams, N. P.; also Jamaica.
Melaniella gracillima Pfr., N. P.; Andros; Watlings Id.; Florida, Cuba, St. Thomas, etc.
Cæcilioides acicula Müller, Nassau, N. P.; Florida; Bermuda.
Zonitoides minusculus Binney, Nassau, N. P.; also Florida, Bermuda, Jamaica.
Succinea ochracina Gundlach, N. P.; Cuba.
Succinea barbadensis Guilding, Andros; Nassau. Also Bermuda, the Antilles, etc.
Veronicella schivelyæ Pilsbry, *var. bahamensis* Dall, Nassau, N. P.; Little Abaco. The type form at Bermuda.
Segmentina (Planorbula) dentata Gould, and
Segmentina dentata var. edentata C. B. Adams, Watlings Id.; Mangrove Cay, Andros; Cuba, St. Thomas, Porto Rico and Jamaica.
Planorbis redfieldi C. B. Adams, Andros; Jamaica.
Physa acuta Draparnaud, Arthurs Town, Cat Id.; Mangrove Cay, Andros; the Antilles generally, western and southern Europe.

Melampus gundlachi Pfr., Nassau, the Antilles, Florida.
Melampus flavus Gmelin, Nassau, the Antilles, Florida.
Melampus caffeus Linné, N. P.; Antilles, Florida.
Detracia bulloides Montagu, N. P.; Andros; also Bermuda, Florida, etc.
Microtralia minuscula Dall, Watlings Id.; also south Florida.
Plecotrema cubense Pfr., Cuba, Bermuda and probably the Bahamas.
Pedipes mirabilis Mühlfeldt, and *var. tridens* Pfr., Andros; the Antilles generally, and Bermuda.
Blauneria pellucida Pfr., Andros Id., Florida, Antilles.
Sayella crosseana var. bahamensis Dall, Watlings Id.; also Haiti at Lake Henriquillo. The type form in Florida.
Onchidium floridanum Dall, Florida, Bermuda and probably the Bahamas.
Williamia krebsi Mörch, Florida Keys to Montevideo.
Siphonaria alternata Say, Andros, Little Abaco, Gun Cay, Florida, Bermuda.
Siphonaria lineolata Orbigny, Florida, Bermuda, Cuba, St. Thomas.
Gadinia carinata Dall, Colon, Barbados, Cuba, Bermuda (as *Siphonaria henica* Verrill and Bush), doubtless also in the Bahamas.
Annularia scabrosa (Humphrey) Pfr., N. P.; Turks Id.; Jamaica.
Rhytidopoma euploca Dall, Inagua.
Colobostylus hydei Weinland, Great Inagua, Crooked id., Fortune Id.
Colobostylus hjalmarsoni Pfr., Crooked Id., Turks Id.
Colobostylus semilabris Lamarck, Crooked Id.
Colobostylus glabratus Reeve, Turks Id.
Colobostylus inaguensis Weinland, Little Inagua; Crooked Id.
Chondropoma bryanti Pfr., Great Inagua.
Chondropoma revinctum Poey, Nassau, N. P., by the Grantstown road; Manzanillo, Cuba.
Chondropoma watlingense Dall, Watlings Id.
Opisthosolen biformis Pfr., Turks Id.; Inagua; Great and Little Abaco; Flamingo Cay; Exuma.
Opisthosolen biformis var. bahamensis Shuttleworth, Nassau, N. P., Andros, Abaco.
Opisthosolen rawsoni Pfr., Watlings Id.; Inagua, Crooked Id.
Helicina calida Weinland, Crooked Id.
Helicina rawsoni Pfr., Inagua; Rum Cay; Watlings Id.
Opisthosolen biformis Pfr., Turks Id.; Inagua; Great and Little Abaco; Flamingo
Helicina fasciata Lamarck, Mangrove Cay, South Bight of Andros; Florida Keys; Porto Rico; Dominica; Guadeloupe; Martinique.
Helicina candida Pfr., Turks Id.
Helicina bryanti Pfr., N. P.; Inagua; Mangrove Cay, Andros.
Trochatella rupestris Pfr. (Bahamas *fide* Bendall, Cuba *fide* Pfeiffer).
Schazicheila bahamensis Pfr., N. P.; Abaco.
Alcadia minima Orbigny, *var.?* (N. P. *fide* Bendall, Cuba *fide* Orbigny).
Truncatella caribaeensis Say, Watlings Id.; Florida, Bermuda, and the Antilles.
Truncatella pulchella Pfr., Watlings Id.; Andros; Southwest Florida, etc.
Truncatella bilabiata Pfr., Long Rock, Abaco; Watlings Id.; N. P.; Florida, etc.
Truncatella subcylindrica Pulteney, N. P.; Watlings Id., Florida, etc.
Truncatella clathrus Lowe, Riding Pt., Grand Bahama; Bermuda, Key West, Porto Rico, St. Thomas, etc.
Assiminea concolor C. B. Adams, Watlings Island; Mangrove Cay, South Bight of Andros; Bermuda; Key West, and vicinity of Tampa, Florida.

FIG. 1.—VIEW OF RAISED CORAL REEF, OVERLAID BY ÆOLIAN LIMESTONE, GREEN CAY.

FIG. 2.—NEARER VIEW OF RAISED CORAL REEF

PHYSIOGRAPHIC AND GEOLOGIC VIEWS

MARINE FOSSILS OF THE BAHAMAS.

Underneath the æolian rock in which, for the most part, the landshells were found, is an older formation which, from its structure and contents, appears to have been formed as a marine sediment in shallow water. This forms the basement rock of the existing Islands. It is sometimes composed of fine calcareous sand, and other portions are composed of a calcareous gravel in which the worn remains of large gastropods, like *Strombus,* or large bivalves, broken up by the action of the surf and mixed with worn pieces of coral, form a gravel with pebbles of appreciable size. A third variety of this rock is chiefly composed of minute oölitic granules, and from its fossil contents appears to have been deposited in lagoons where the evaporation of the sea water had markedly increased the proportion of salt in the water, forming "salines" or "salt pans" as in Watlings Island, or Turks Island of the present archipelago. Still another form, usually nearly or quite destitute of recognizable fossils, shows the oölitic structure in nodules of larger size, from a few millimeters to a couple of centimeters in diameter.

The marine mollusks are those of the present shallow-water fauna of the Bahamas. All of them, so far observed, occur living and unchanged in the present waters of the archipelago. I have given under the heads of the several stations a list of the species found by the expedition at each locality from which material was received.

The following species may be regarded as characteristic forms of the sedimental Bahama limestone as collected by the Expedition.

Corals.

Porites.
Meandrites.
Favia.
Agaricia.

All too imperfectly preserved to be specifically identified but probably identical with living species of the present reefs.

Crustaceans.

Balanus, fragments.
Claw of crab.

Mollusks.

Ostrea parasitica Gmelin (Mangrove oyster).
Mytilus exustus Linné.
Lithophaga antillarum Orb.
Margaritiphora radiata Leach.

Arca occidentalis Phil. Plate XI, Fig. 4.
Arca umbonata Lam.
Barbatia candida Gmelin.
Barbatia reticulata Gmelin. Plate XII, Figs. 7, 9.
Scapharca transversa Say.
Glycymeris americana Defrance.
Cardita (Glans) dominguensis Orb.
Chama macerophylla Chemnitz.
Chama sarda Reeve.
Hemicardium medium Linné.
Codakia orbicularis Linné. Plate XI, Fig. 2.
Phacoides pensylvanicus Linné. Plate XI, Fig. 1.
Phacoides radians Conrad.
Phacoides trisulcatus Conrad.
Phacoides nassula Conrad.
Divaricella quadrisulcata Orb.
Anomalocardia cuneimeris Conrad.
Chione cancellata Linné.
Macrocallista nebulosa Solander.
Tellina radiata Linné. Plate XI, Fig. 3.
Strigilla carnaria Linné.
Bulla striata Bruguière.
Olivella nivea Gmelin.
Nassa ambigua Montagu.
Columbella mercatoria Linné.
Murex nucens Mörch.
Pyrula papyratia Say.
Cypræa cinerea Linné.
Trivia pediculus Linné.
Strombus gigas Linné.
Bittium varium Pfr.
Cerithium floridanum Mörch.
Cerithium algicola Adams.
Cerithium septemstriatum Say.
Cerithium semiferrugineum Lam.
Tectarius muricatus Linné.
Torinia canalifera Adams.
Natica canrena Lam.
Natica castrensis Dall.
Polynices lacteus Guilding.
Acmæa punctulata Gmelin.
Astralium imbricatum Gmelin.
Livona pica Linné.
Nerita versicolor Lam.
Nerita tesselata Gmelin.
Fissurella listeri Orb.
Spirula australis (Lam.) Pels.

The absence of echinoderms from this list is noticeable. No attempt has been made to identify the foraminifera, which are not numerous.

THE FAUNA OF THE "SALT PANS."

The fauna of the hypersaline pans or lagoons is perhaps worth a few paragraphs of comment.

In 1894 the writer made a study of a quantity of material from Watlings Island lagoon, collected by Prof. A. Agassiz, Dr. J. J. Brown and the U. S. Fish Commission. This comprised species living in the highly saline waters of the lagoon and others which frequent the dry land on its borders, both being mingled in the drift on the shores of the lagoon. Several species were found to be characteristic of the lagoon waters, though probably all its population was derived from species ordinarily frequenting the shallow water of the sea adjacent to the shores of the island, and which, notwithstanding the gradual increase in salinity after the lagoon was cut off from the free access of sea water, had managed to survive. These species under the peculiar conditions in which they were then placed became modified until several of them developed well-marked specific differences.

The changes to which they were subjected appear to have been an increase in the salinity and consequently in the specific gravity of the water; higher temperature; and greater exposure to sunlight.

All the lagoon species as compared with their nearest allies exhibited certain common differences; these were tenuity of shell, diminutive size, and intensification of color when the species was other than black or white. These differences may reasonably be ascribed to the new conditions operating upon all the species exposed to them. The list is as follows:

Mytilus dominguensis Orbigny, variety.
Avicula atlantica Lamarck, variety.
Melina obliqua Lamarck, dwarfed form.
Tellina mera Hanley, variety.
**Cyrena colorata* Prime.
**Anomalocardia leptalea* Dall.
Haminea antillarum Orbigny, dwarfed.
**Tornatina parviplica* Dall.
Assiminea auberiana Orbigny.
**Cerithium (Pyrazus) rawsoni* Krebs.
**Cerithium var. degeneratum* Dall.
**Cerithidea tenuis* Pfeiffer.

The species preceded by an asterisk are peculiar to the lagoons.

More recently, through the kind offices of Mr. C. Lyon Hall and Mr. R. Furbush of Port au Prince, Haiti, I obtained a lot of material from the great salt lagoon known as Lake Henriquillo. This was somewhat adulterated by the presence of a number of species from the fresh water streams which fall

into the lake, but, abstraction made of these, the facies of the remainder is strikingly like that of the Watlings Island group of shells.

Common to the Bahama and Haitian lagoons are:

Mytilus dominguensis Orb.
Cerithium degeneratum Dall.
Cerithidea tenuis Pfr.

An *Anomalocardia* occurs abundantly, but it has been less modified than *A. leptalea*, the place of which in the Haitian list it occupies. It is more like the fossil form from the salt pond on Long Island at Station 7. The most abundant shell by far in the lot is a *Cerithium*, which occupies much the same place in the Haitian list that *C. rawsoni* does in the Bahama one, but which is obviously a modification of *C. minimum* Gmelin.

What appears to be a species of *Parastarte*, a *Bittium*, and a *Dentalium* complete the Haitian list which, on the whole, gives the impression that the water must be less saline than in the Watlings lagoon, or that it has been in existence a shorter time, so that the surviving species have not reached so high a degree of modification. A careful study of the fauna of all the West Indian salt pans would doubtless give interesting results.

Explanation of Plates.

The figures are natural size except when otherwise stated.

Plate XI.

Characteristic Marine Bahama Fossils.

Fig. 1. *Phacoides pensylvanicus* Linné.
Fig. 2. *Codakia orbicularis* Linné.
Fig. 3. *Tellina radiata* Linné.
Fig. 4. *Arca occidentalis* Philippi.

Plate XII.

Fig. 1. *Cepolis (Plagioptycha) inaguana* Dall, profile; 3/2. See p. 38.
Fig. 2. *Cepolis (Plagioptycha) pharcida* Dall, base. See p. 33.
Fig. 3. *Cepolis (Plagioptycha) pharcida* Dall, profile. See p. 33.
Fig. 4. *Cerion (Strophiops) rhyssum* Dall, normal. See p. 34.
Fig. 5. *Cerion (Strophiops) agassizii* Dall. See p. 33.
Fig. 6. *Cerion (Strophiops) rhyssum* Dall, depressed mutation, shell not quite adult. See p. 34.
Fig. 7. *Arca (Barbatia) reticulata* Gmelin, interior of left valve; 3/2.
Fig. 8. *Cepolis (Plagioptycha) agassizii* Dall. The outer lip is defective above. See p. 32.
Fig. 9. *Arca (Barbatia) reticulata* Gmelin, exterior of right valve; 3/2.

FIG. 1.—VIEW OF OCEAN HOLE, TARPUM BAY, ELEUTHERA

FIG. 2.—VIEW OF OLD SEA-CLIFF WITH CAVERN, NEW PROVIDENCE

PHYSIOGRAPHIC AND GEOLOGIC VIEWS

PLATE XIII.

FIG. 1. *Helicina rawsoni* Pfeiffer, base; 3/2. See p. 36.

FIG. 2. *Cepolis (Plagioptycha) inaguana* Dall, base; 3/2. See p. 38.

FIG. 3. *Helicina rawsoni* Pfeiffer, profile; 3/2. See p. 36.

FIG. 4. *Cepolis (Hemitrochus) exumana* Dall, base; 3/2. See p. 37.

FIG. 5. *Cepolis (Plagioptycha) gregoriana* Dall, base; 3/2. See p. 37.

FIG. 6. *Cepolis duclosiana* variety *columbiana* Dall, base; 3/2. See p. 38.

FIG. 7. *Cepolis (Hemitrochus) exumana* Dall; 3/2. See p. 37.

FIG. 8. *Cepolis (Plagioptycha) gregoriana* Dall, profile; 3/2. See p. 37.

FIG. 9. *Cepolis duclosiana* variety *columbiana* Dall, profile; 3/2. See p. 38.

TIDES AND BENCH MARKS AT NASSAU, NEW PROVIDENCE

TIDES AND BENCH MARKS AT NASSAU, NEW PROVIDENCE

BY

L. P. SHIDY,

Chief of the Tidal Division, U. S. Coast and Geodetic Survey.

INTRODUCTION.

In the latter part of June, 1903, Dr. Oliver L. Fassig, a member of the Bahama Expedition of the Geographical Society, of Baltimore, established an automatic tide gauge at Nassau, New Providence. The gauge, one of the

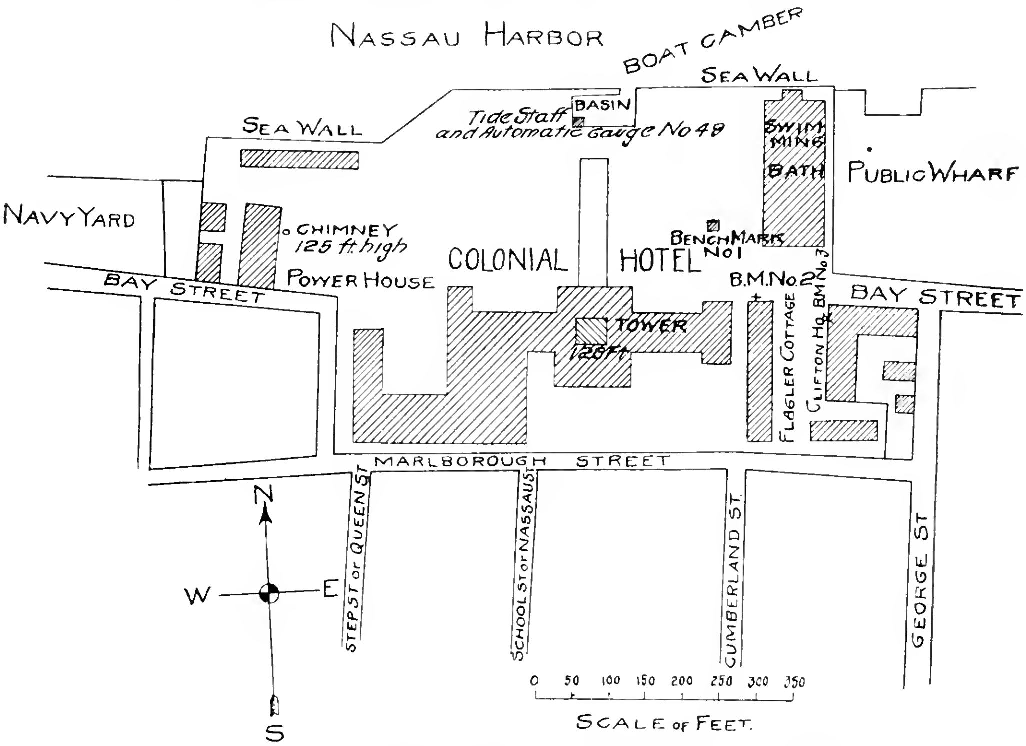


FIG. 1.—Diagram Showing Location of Tide Gauge and Bench Marks.

Saxton type, No. 49, scale 1 : 9 (Plate XIV, Fig. 2), was loaned by the U. S. Coast and Geodetic Survey to the Geographical Society of Baltimore. Through the courtesy of Mr. H. M. Flagler, this gauge was located in the Basin or Boat Camber of the Colonial Hotel grounds, about an eighth of a mile

east of the Navy Yard, and a fixed tide staff was secured to the north side of the gauge house (Plate XV, Fig. 1). Mr. W. C. Townsend, an employee of the Colonial Hotel, was engaged as tide observer, and proved to be a faithful and careful man, so that the first year of records, which are now available, are quite satisfactory. The preceding sketch shows the location of the tide gauge and bench marks.

DESCRIPTION OF BENCH MARKS.

The three following bench marks were established by Dr. Fassig and connected by spirit levels with the fixed tide staff:

Bench Mark No. 1 (Plate XV, Fig. 2) is the raised horizontal line of a circular bronze tablet, about 3 inches in diameter, and 10 inches above the ground, which is set in the side of a granite post, in the grounds of the Colonial Hotel, about 225 feet southeast from the tide gauge and 100 feet north of the eastern wing of the hotel. The stone projects about 30 inches out of the ground, the upper portion being dressed to about 12 x 18 inches. The base is cemented into a socket cut in the solid coral rock and surrounded by blocks of limestone set in portland cement. On the top of the stone is a bronze plate bearing the following inscription:

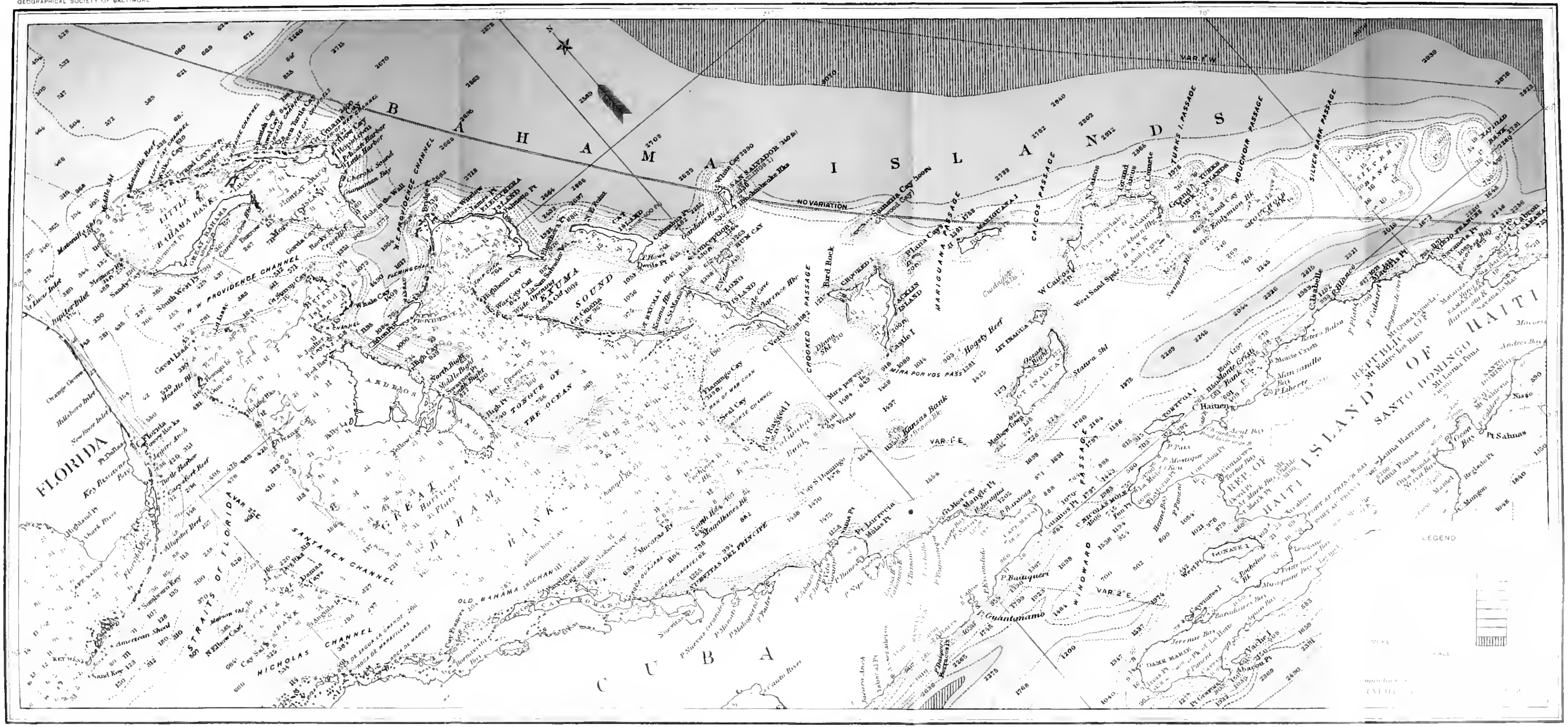
THIS BENCH MARK WAS ESTABLISHED BY THE
BAHAMA EXPEDITION OF THE GEOGRAPHICAL SOCIETY
OF BALTIMORE
IN CO-OPERATION WITH THE
UNITED STATES COAST AND GEODETIC SURVEY
AND BY THE COURTESY OF THE
GOVERNMENT OF THE BAHAMA ISLANDS
IN THE YEAR OF OUR LORD 1903

SIR GILBERT THOMAS CARTER
GOVERNOR BAHAMA ISLANDS
DANIEL COIT GILMAN
PRESIDENT GEOGRAPHICAL SOCIETY OF BALTIMORE
OTTO HILGARD TITTMANN
SUPERINTENDENT UNITED STATES COAST AND GEODETIC SURVEY
GEORGE BURBANK SHATTUCK
DIRECTOR BAHAMA EXPEDITION

On June 26, 1903, Dr. O. L. Fassig found by spirit levels that Bench Mark No. 1 was 10.508 feet above zero of the fixed tide staff.

Bench Mark No. 2 is the raised horizontal line of a circular bronze tablet about 3 inches in diameter, which is cemented into the north stone wall of the Flagler Cottage, about 4 feet from the ground. This is a very old building and not likely to settle. On June 26, 1903, Bench Mark No. 2 was found by spirit levels to be 14.108 feet above zero of the fixed tide staff.

Bench Mark No. 3 is the raised horizontal line of a circular bronze tablet,



MAP SHOWING BAHAMA ISLANDS AND ADJACENT LAND MASSES

about 3 inches in diameter, which is cemented into the west stone wall of the Clifton Hotel, about 5 feet above the ground. This building is also very old and therefore quite stable. On June 26, 1903, Bench Mark No. 3 was found by spirit levels to be 14.108 feet above zero of the fixed tide staff, having been set at exactly the same elevation as Bench Mark No. 2.

Mean of 707 high waters on the fixed tide staff	4.332 ft.
Mean of 707 low " " " " " "	1.698 "
Mean half-tide level " " " " " "	3.015 "
Mean sea level " " " " " "	2.991 "
Mean range of tide " " " " " "	2.634 "

Elevation of Bench Marks.	B. M. 1. ft.	B. M. 2. ft.	B. M. 3. ft.
Above mean high water	6.176	9.776	9.776
Above mean low water	8.810	12.410	12.410
Above mean half-tide level	7.493	11.093	11.093
Above mean sea level	7.517	11.117	11.117

Mean half-tide level is the mean of all the high and low waters for the year, that is, if we abbreviate to initial letters, we have

$$HTL = \tfrac{1}{2}(HW + LW).$$

Mean sea level is the mean of the hourly heights of the sea throughout the year, or

$$MSL = \frac{1}{n}\Sigma(h_0 + h_1 + h_2 + \ldots\ldots h_{22} + h_{23})$$

in which Σh represents the sum of all the heights throughout the series for the hour designated by the subscript. In a common year $n = 24 \times 365$ and in a leap year $n = 24 \times 366$.

When the harmonic constants for the station are known, the approximate value of mean half-tide level may be computed by the formula

$$HTL = MSL + M_4 \cos(2M_2^0 - M_4^0) - 0.04\frac{(K_1 + O_1)^2}{M_2}\cos(M_2^0 - K_1^0 - O_1^0)$$

where

HTL = mean half-tide level

MSL = " sea level

M_2, M_2^0, M_4, M_4^0, K_1, K_1^0, O_1, O_1^0 are harmonic constants defined further on.

TIDES AT NASSAU.

Tide Records.

The tide record for Nassau consists of curves traced by the tide gauge, and these marigrams or tide curves were tabulated in order to obtain the hourly heights of the sea, and the times and heights of high and low waters which are given here. The time used is mean local civil for Nassau, the approximate time meridian being 77° 21′ or 5h. 09m. west of Greenwich. The heights are expressed in English feet and tenths, and are reduced to the fixed tide staff, so that they may be referred to the bench marks.

JULY, 1903.

Day of Month..	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Hours	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
0	(3.8)	*3.3	3.3	(2.9)	2.3	2.0	1.9	2.0	2.2	2.7	(2.9)	3.2	3.7	3.9	4.2	4.4
1	(3.5)	3.5	3.8	(3.4)	2.6	2.3	2.0	2.0	2.0	2.2	(2.3)	2.6	3.0	3.3	3.8	4.1
2	(2.9)	3.4	4.1	(3.8)	3.2	2.8	2.4	2.1	2.1	2.0	(2.0)	2.1	2.4	2.7	3.2	3.6
3	(2.2)	3.1	4.1	(4.1)	3.7	3.3	2.8	2.7	2.4	2.1	(2.0)	2.0	2.1	2.2	2.6	3.0
4	(1.7)	2.5	4.0	(4.1)	3.9	3.7	3.3	3.2	2.9	2.5	(2.3)	2.1	2.0	1.9	2.2	2.6
5	(1.2)	1.9	3.5	(3.7)	3.7	3.8	3.7	3.6	3.4	3.0	(2.7)	2.5	2.2	1.9	2.0	2.3
6	(0.9)	1.3	2.9	(3.2)	3.3	3.7	3.8	3.9	3.7	3.4	3.2	3.1	2.7	2.3	2.1	2.2
7	0.9	0.9	2.2	(2.7)	2.8	3.3	3.5	3.8	3.9	3.8	3.7	3.6	3.2	2.7	2.4	2.3
8	1.1	(1.1)	1.7	2.2	2.2	2.8	3.1	3.5	3.7	3.9	4.0	3.9	3.7	3.2	2.9	2.7
9	1.6	1.9	1.8	1.7	(1.7)	2.2	2.6	3.1	3.4	3.8	3.9	4.0	4.0	3.7	3.5	3.2
10	2.3	2.5	2.1	1.7	1.6	1.8	2.1	2.5	2.9	3.4	3.6	3.9	4.1	4.0	3.9	3.8
11	3.1	3.1	2.6	1.8	1.7	1.6	1.7	2.0	2.4	2.9	3.0	3.4	3.8	4.0	4.2	4.2
Noon	3.6	3.8	3.2	2.3	2.1	1.8	1.7	1.7	1.9	2.4	2.5	2.9	3.4	3.8	4.2	4.4
13	3.8	4.3	3.9	3.0	2.7	2.2	2.0	1.8	1.7	2.0	2.1	2.4	2.8	3.4	3.9	4.3
14	3.6	4.5	(4.5)	3.7	3.4	2.8	2.4	2.2	1.9	1.8	1.8	2.1	2.4	2.9	3.5	4.0
15	3.2	4.4	(4.6)	4.3	4.1	3.5	3.1	2.8	2.3	2.1	1.9	2.0	2.1	2.4	3.0	3.5
16	2.6	4.0	(4.5)	4.6	4.6	4.1	3.8	3.5	2.9	2.5	2.3	2.2	2.1	2.1	2.5	3.0
17	2.0	3.5	(3.9)	4.4	4.7	4.6	4.4	4.1	3.7	3.2	2.9	2.8	2.3	2.0	2.3	2.6
18	1.5	2.9	(3.4)	4.0	4.5	4.6	4.7	4.6	4.3	3.9	3.6	3.4	2.7	2.3	2.3	2.4
19	1.2	2.4	(2.9)	3.5	3.9	4.3	4.6	4.7	4.7	4.5	4.2	3.9	3.3	2.8	2.6	2.4
20	1.2	2.1	(2.4)	2.9	3.3	3.8	4.2	4.4	4.7	4.9	4.6	4.5	3.9	3.3	3.1	2.7
21	1.6	2.1	(2.1)	2.4	2.6	3.0	3.6	3.9	4.5	4.8	4.7	4.7	4.3	3.9	3.6	3.1
22	2.1	2.3	(2.1)	2.1	2.3	2.5	3.0	3.4	3.9	4.2	4.4	4.6	4.5	4.3	4.0	3.6
23	2.8	2.8	(2.5)	2.0	2.0	2.0	2.4	2.7	3.3	3.6	3.8	4.2	4.3	4.4	4.4	4.0

JULY, 1903.—Continued.

Day of Month......	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Hours	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
0	4.2	3.9	3.6	3.2	2.6	2.0	1.7	1.8	2.4	3.0	3.7	4.3	4.6	4.5	4.0
1	4.2	4.1	3.9	3.7	3.0	2.3	1.8	1.6	1.7	2.1	2.9	3.6	4.1	4.2	4.2
2	3.8	4.0	4.1	4.1	3.6	2.9	2.2	1.8	1.5	1.4	2.0	2.7	3.4	3.7	3.9
3	3.4	3.6	3.9	4.2	4.0	3.5	2.8	2.3	1.7	1.3	1.5	2.0	2.6	3.1	3.4
4	2.8	3.1	3.6	4.0	4.2	4.0	3.6	3.1	2.3	1.7	1.4	1.5	2.0	2.4	2.8
5	2.1	2.6	3.1	3.7	4.0	4.3	4.2	3.8	3.1	2.2	1.7	1.5	1.6	1.8	2.3
6	2.1	2.2	2.5	3.1	3.6	4.1	4.5	4.4	3.9	3.0	2.3	1.8	1.6	1.6	1.8
7	2.0	2.0	2.1	2.6	3.0	3.6	4.2	4.6	4.5	3.8	3.2	2.4	2.0	1.6	1.6
8	2.2	2.0	1.9	2.1	2.4	2.9	3.6	4.4	4.8	4.4	3.9	3.2	2.6	2.0	1.7
9	2.6	2.3	1.9	1.8	1.8	2.2	2.9	3.8	4.5	4.7	4.5	4.0	3.4	2.6	2.0
10	3.2	2.7	2.3	2.0	1.6	1.6	2.2	2.9	3.8	4.3	4.7	4.6	4.1	3.3	2.7
11	3.8	3.3	2.8	2.3	1.7	1.3	1.5	2.1	2.9	3.7	4.4	4.7	4.6	4.0	3.4
Noon	4.2	3.9	3.6	3.0	2.1	1.5	1.2	1.4	2.0	2.8	3.8	4.5	4.7	4.5	4.0
13	4.4	4.3	4.2	3.8	2.9	2.0	1.5	1.2	1.4	2.0	3.0	3.8	4.4	4.4	4.4
14	4.2	4.5	4.6	4.4	3.8	2.9	2.0	1.5	1.1	1.4	2.2	3.1	3.8	4.2	4.4
15	3.9	4.4	4.8	4.9	4.5	3.8	3.0	2.1	1.4	1.2	1.6	2.3	3.2	3.7	4.2
16	3.4	4.0	4.6	5.0	5.1	4.7	4.0	3.0	1.9	1.6	1.4	1.8	2.4	3.0	3.6
17	2.9	3.5	4.1	4.8	5.2	5.3	4.8	4.0	2.8	2.1	1.6	1.6	2.0	2.5	3.1
18	2.5	3.0	3.6	4.3	4.8	5.3	5.4	4.9	3.8	3.0	2.2	1.9	1.8	2.0	2.5
19	2.3	2.6	2.9	3.6	4.3	5.0	5.4	5.4	4.8	4.0	2.9	2.4	2.1	1.9	2.2
20	2.4	2.3	2.5	2.9	3.5	4.3	4.9	5.5	5.3	4.8	3.9	3.1	2.5	2.1	2.1
21	2.6	2.3	2.3	2.4	2.7	3.5	4.2	5.0	5.3	5.2	4.6	3.9	3.1	2.4	2.2
22	3.1	2.6	2.4	2.2	2.2	2.6	3.3	4.2	4.8	5.1	4.9	4.5	3.8	3.0	2.6
23	3.6	3.1	2.7	2.2	1.9	2.0	2.4	3.3	3.9	4.6	4.9	4.7	4.3	3.6	3.1

* The values in parentheses are interpolated.

AUGUST, 1903.

Day of Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Hours	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
0	3.5	3.0	2.5	2.3	2.1	2.4	2.8	2.7	2.8	3.1	3.3	3.7	4.1	4.1	4.0	4.2
1	3.8	3.5	2.9	2.6	2.3	2.2	2.3	2.2	2.3	2.5	2.6	3.1	3.5	3.6	3.7	4.3
2	4.0	3.8	3.3	3.1	2.8	2.3	2.0	2.0	2.1	2.1	2.2	2.5	2.9	2.9	3.2	4.0
3	3.8	3.9	3.7	3.5	3.2	2.6	2.1	2.2	2.2	2.0	1.9	2.2	2.4	2.4	2.6	3.5
4	3.4	3.7	3.7	3.8	3.7	3.1	2.5	2.5	2.5	2.3	2.0	2.1	2.1	2.1	2.1	3.0
5	2.8	3.3	3.5	3.9	3.9	3.6	3.0	3.1	3.0	2.7	2.4	2.4	2.3	2.0	1.9	2.5
6	2.3	2.8	3.2	3.7	3.8	3.9	3.5	3.6	3.6	3.2	3.0	3.0	2.7	2.3	2.0	2.1
7	1.9	2.3	2.7	3.2	3.6	4.0	3.9	4.0	4.0	3.8	3.6	3.5	3.3	2.7	2.2	2.1
8	1.7	1.9	2.3	2.7	3.2	4.0	4.0	4.1	4.3	4.1	4.1	4.1	3.9	3.4	2.6	2.3
9	1.8	1.8	1.8	2.3	2.7	3.6	3.8	3.8	4.2	4.2	4.3	4.6	4.4	3.9	3.2	2.8
10	2.2	1.9	1.7	1.9	2.2	3.1	3.3	3.4	3.7	3.9	4.2	4.6	4.7	4.3	3.9	3.4
11	2.7	2.3	1.8	1.8	1.9	2.5	2.8	2.9	3.2	3.4	3.8	4.4	4.7	4.5	4.4	4.1
Noon	3.4	2.8	2.3	2.1	2.0	2.1	2.3	2.3	2.6	2.9	3.2	3.9	4.3	4.4	4.6	4.6
13	4.0	3.5	2.9	2.6	2.2	1.9	1.9	2.0	2.2	2.3	2.7	3.4	3.8	3.9	4.6	4.9
14	4.5	4.1	3.6	3.2	2.7	2.0	1.9	1.9	2.0	2.0	2.2	2.8	3.2	3.4	4.3	4.7
15	4.5	4.4	4.2	3.9	3.4	2.4	2.1	2.2	2.1	1.9	2.0	2.4	2.7	2.8	3.8	4.4
16	4.2	4.5	4.5	4.4	4.0	3.0	2.6	2.7	2.5	2.2	2.2	2.4	2.5	2.4	3.3	3.9
17	3.8	4.1	4.5	4.7	4.6	3.7	3.4	3.4	3.0	2.6	2.6	2.6	2.4	2.2	2.7	3.3
18	3.2	3.7	4.2	4.7	4.8	4.3	4.0	4.1	3.7	3.3	3.1	3.0	2.6	2.3	2.5	2.8
19	2.7	3.1	3.7	4.3	4.8	4.6	4.5	4.6	4.4	3.9	3.8	3.6	3.1	2.6	2.4	2.5
20	2.3	2.6	3.1	3.7	4.5	4.7	4.7	4.7	4.7	4.4	4.3	4.1	3.7	3.1	2.6	2.5
21	2.1	2.1	2.6	3.1	4.0	4.5	4.5	4.5	4.7	4.6	4.6	4.5	4.2	3.6	3.0	2.7
22	2.2	2.0	2.2	2.6	3.4	4.0	4.0	4.1	4.3	4.4	4.6	4.7	4.4	4.0	3.5	3.2
23	2.5	2.1	2.1	2.2	2.8	3.4	3.3	3.5	3.7	3.9	4.2	4.5	4.4	4.2	3.9	3.6

AUGUST, 1903.—Continued.

Day of Month	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Hours	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
0	4.0	3.6	3.0	2.4	1.9	1.6	1.8	2.1	2.9	3.6	3.9	4.2	4.2	3.9	3.4
1	4.3	4.1	3.5	2.9	2.2	1.6	1.4	1.5	2.0	2.7	3.3	3.8	4.1	4.1	3.7
2	4.3	4.3	4.1	3.6	2.8	2.0	1.5	1.2	1.5	2.0	2.6	3.2	3.8	4.0	4.0
3	4.0	4.3	4.4	4.2	3.6	2.7	2.0	1.4	1.3	1.5	1.9	2.6	3.2	3.6	3.9
4	3.6	4.0	4.4	4.6	4.2	3.6	2.8	1.9	1.6	1.4	1.5	2.0	2.7	3.1	3.6
5	3.0	3.5	4.0	4.6	4.7	4.3	3.7	2.8	2.2	1.7	1.6	1.7	2.2	2.6	3.1
6	2.5	2.9	3.4	4.2	4.6	4.7	4.4	3.6	3.1	2.2	1.9	1.8	1.9	2.2	2.7
7	2.1	2.3	2.8	3.6	4.1	4.7	4.8	4.5	4.0	3.1	2.5	2.1	2.0	2.0	2.3
8	2.1	2.0	2.2	2.8	3.5	4.2	4.7	4.9	4.6	3.9	3.3	2.7	2.4	2.1	2.2
9	2.4	1.9	1.8	2.2	2.6	3.4	4.1	4.7	4.9	4.6	4.1	3.4	2.9	2.4	2.2
10	2.9	2.3	1.8	1.8	1.9	2.5	3.3	4.2	4.7	4.9	4.6	4.1	3.6	2.9	2.5
11	3.6	2.9	2.1	1.7	1.4	1.8	2.4	3.3	4.2	4.7	4.8	4.6	4.2	3.5	3.0
Noon	4.2	3.6	2.7	2.0	1.4	1.3	1.6	2.4	3.3	4.1	4.6	4.7	4.6	4.0	3.6
13	4.7	4.3	3.6	2.7	1.8	1.3	1.1	1.6	2.5	3.4	4.0	4.5	4.7	4.4	4.2
14	5.0	4.9	4.4	3.6	2.4	1.6	1.2	1.2	1.8	2.6	3.4	4.0	4.6	4.6	4.5
15	4.9	5.2	5.1	4.6	3.5	2.4	1.8	1.3	1.4	1.9	2.7	3.4	4.1	4.4	4.6
16	4.6	5.1	5.3	5.2	4.5	3.4	2.6	1.8	1.6	1.6	2.1	2.8	3.6	4.0	4.5
17	4.0	4.6	5.2	5.5	5.2	4.4	3.6	2.6	2.0	1.7	1.9	2.3	3.0	3.4	4.1
18	3.4	4.0	4.6	5.3	5.4	5.2	4.5	3.6	2.8	2.1	2.0	2.1	2.5	2.9	3.6
19	2.8	3.4	4.0	4.7	5.1	5.4	5.1	4.4	3.6	2.8	2.4	2.2	2.3	2.5	3.1
20	2.5	2.7	3.2	3.9	4.5	5.1	5.2	4.9	4.3	3.5	3.0	2.6	2.4	2.3	2.6
21	2.4	2.4	2.6	3.1	3.7	4.4	4.7	5.0	4.8	4.1	3.6	3.1	2.7	2.4	2.4
22	2.6	2.3	2.2	2.4	2.7	3.5	4.0	4.6	4.7	4.5	4.1	3.7	3.1	2.6	2.5
23	3.1	2.6	2.1	2.0	2.0	2.5	3.1	3.8	4.3	4.4	4.3	4.0	3.5	3.0	2.7

SEPTEMBER, 1903.

Day of Month..	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Hours	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
0	3.2	2.8	2.3	2.4	2.3	2.6	2.9	3.1	3.4	3.5	4.3	(4.1)	(4.1)	(4.1)	(3.9)	3.2
1	3.6	3.2	2.6	2.6	2.3	2.4	2.5	2.6	2.8	2.8	3.4	(3.6)	(3.7)	(4.1)	(4.2)	3.7
2	3.9	3.6	3.1	2.9	2.6	2.5	2.5	2.4	2.5	2.3	2.7	(2.9)	(3.1)	(3.7)	(4.1)	4.0
3	4.1	4.0	3.5	3.4	3.0	2.9	2.8	2.5	(2.6)	2.1	(2.3)	(2.4)	(2.5)	(3.2)	(3.8)	3.9
4	3.9	4.1	3.9	3.8	3.6	3.4	3.3	2.9	(3.0)	2.3	(2.1)	(2.1)	(2.1)	(2.7)	(3.3)	3.5
5	3.6	3.9	4.0	4.2	4.1	4.0	3.9	3.6	(3.4)	2.6	(2.4)	(2.1)	(1.9)	(2.2)	(2.6)	3.1
6	3.2	3.6	3.8	4.4	4.4	4.5	4.5	4.2	(3.8)	3.3	(2.9)	(2.5)	(1.9)	(1.8)	1.9	2.5
7	2.7	3.1	(3.4)	4.1	4.5	4.7	4.9	4.8	(4.2)	4.0	(3.6)	(3.0)	(2.3)	(1.9)	1.6	2.0
8	2.4	2.7	(2.8)	3.7	4.2	4.6	5.0	5.1	4.5	4.5	(4.3)	(3.8)	(2.8)	(2.2)	1.7	1.8
9	2.2	2.3	(2.4)	3.2	3.7	4.2	4.7	5.0	4.7	5.0	(4.8)	(4.3)	(3.4)	(2.8)	2.0	1.8
10	2.3	2.0	2.1	2.7	3.2	3.7	4.1	4.6	4.4	5.1	(5.1)	(4.7)	(4.1)	(3.4)	2.7	2.1
11	2.7	2.1	2.0	2.3	2.7	3.1	3.5	4.0	3.9	4.8	(5.0)	(4.8)	(4.6)	(4.1)	3.4	2.7
Noon	3.2	2.5	2.3	2.1	2.3	2.6	2.9	3.3	3.3	4.4	(4.5)	(4.6)	(4.7)	(4.5)	4.0	3.4
13	3.8	3.0	2.7	2.4	2.2	2.4	2.5	2.8	2.7	3.9	(3.9)	(4.1)	(4.5)	(4.7)	4.5	4.3
14	4.3	3.6	3.3	2.8	2.5	2.5	2.4	2.5	2.2	3.5	(3.2)	(3.4)	(4.1)	4.4	4.6	4.8
15	4.6	4.1	3.9	3.4	3.0	2.9	2.7	2.5	2.0	3.1	(2.7)	(2.8)	(3.5)	3.7	4.4	4.9
16	4.7	4.4	4.4	4.1	3.7	3.5	3.2	2.9	2.1	3.0	(2.4)	(2.4)	(2.8)	3.2	4.0	4.6
17	4.5	4.5	4.7	4.6	4.4	4.2	3.9	3.5	2.5	3.2	(2.4)	(2.2)	(2.4)	2.6	3.4	4.1
18	4.0	4.3	4.7	4.8	4.9	4.9	4.6	4.1	3.2	3.7	(2.7)	(2.2)	(2.2)	2.2	2.8	3.6
19	3.5	3.8	4.4	4.8	5.0	5.2	5.1	4.7	3.9	4.2	(3.2)	(2.6)	(2.2)	2.0	2.3	2.9
20	3.0	3.2	3.9	4.3	4.8	5.1	5.2	5.0	4.5	4.7	(3.9)	(3.2)	(2.4)	(2.0)	2.0	2.2
21	2.6	2.7	3.3	3.8	4.3	4.7	4.9	5.1	4.7	5.2	(4.4)	(3.7)	(2.9)	(2.3)	2.0	2.0
22	2.4	2.3	2.8	3.2	3.7	4.2	4.4	4.7	4.6	5.3	(4.6)	(4.1)	(3.4)	(2.7)	2.2	2.0
23	2.5	2.1	2.4	2.7	3.1	3.5	3.8	4.1	4.2	5.1	(4.5)	(4.3)	(3.9)	(3.2)	2.7	2.3

SEPTEMBER, 1903.—Continued.

Day of Month	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Hours	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
0	2.9	2.3	1.8	(1.6)	(1.7)	2.3	3.0	3.4	3.8	4.0	4.0	3.8	3.5	3.3
1	3.5	2.8	2.2	(1.7)	(1.5)	1.7	2.3	2.7	3.2	3.6	3.8	3.9	3.8	3.6
2	4.0	3.6	2.9	(2.2)	(1.7)	1.6	1.9	2.1	2.5	3.1	3.4	3.7	3.9	3.8
3	4.3	4.2	3.7	(3.0)	(2.3)	1.8	1.8	1.9	2.0	2.6	3.0	3.3	3.7	3.9
4	4.1	4.6	4.4	(3.4)	(3.1)	2.4	2.2	2.0	1.8	2.1	2.5	2.9	3.3	3.7
5	3.6	4.5	4.8	(4.6)	(4.1)	3.3	2.9	2.5	1.9	1.9	2.1	2.4	2.9	3.3
6	3.0	4.1	4.9	(5.0)	(4.8)	4.2	3.7	3.4	2.3	2.0	2.0	2.1	2.6	2.9
7	2.4	3.5	4.5	(5.0)	(5.1)	4.9	4.5	4.1	2.9	2.3	2.1	2.1	2.3	2.6
8	1.9	2.8	3.7	(4.4)	(4.9)	5.3	5.2	4.8	3.6	2.9	2.5	2.3	2.3	2.3
9	1.7	2.1	3.0	(3.6)	(4.3)	5.2	5.5	5.1	4.3	3.6	3.1	2.6	2.5	2.2
10	1.8	1.7	2.1	(2.7)	(3.5)	4.6	5.2	5.2	4.8	4.3	3.7	3.1	2.8	2.4
11	2.2	1.6	1.6	(1.9)	(2.6)	3.7	4.6	4.8	4.9	4.6	4.2	3.7	3.3	2.8
Noon	2.9	2.0	1.5	(1.4)	(1.9)	2.8	3.7	4.1	4.6	4.6	4.5	4.1	3.7	3.3
13	3.6	2.5	1.8	(1.5)	(1.4)	2.1	2.9	3.3	4.0	4.3	4.5	4.3	4.2	3.8
14	4.4	3.4	2.4	(1.8)	(1.5)	1.7	2.2	2.5	3.3	3.8	4.1	4.3	4.4	4.2
15	4.9	4.3	3.3	(2.6)	(2.0)	1.8	2.0	2.0	2.6	3.2	3.6	4.0	4.4	4.4
16	5.0	5.0	4.3	(3.5)	(2.8)	2.2	2.1	1.9	2.2	2.7	3.1	3.5	4.1	4.3
17	4.8	5.3	5.0	(4.4)	(3.8)	3.0	2.6	2.1	2.9	2.3	2.6	3.0	3.6	4.0
18	4.2	5.1	5.3	(5.0)	4.5	3.8	3.4	2.5	2.1	2.1	2.3	2.6	3.1	3.5
19	3.5	4.6	5.1	(5.2)	4.9	4.6	4.1	3.2	2.4	2.2	2.2	2.3	2.7	3.0
20	2.8	3.7	4.5	(4.8)	5.1	5.0	4.8	3.8	3.0	2.6	2.3	2.2	2.5	2.6
21	2.1	2.9	3.7	(4.0)	4.7	5.0	5.0	4.3	3.5	3.0	2.7	2.4	2.4	2.4
22	1.8	2.1	2.8	(3.2)	4.0	4.6	4.8	4.5	4.0	3.5	3.0	2.7	2.6	2.3
23	1.9	1.8	2.1	(2.3)	3.1	3.9	4.2	4.3	4.2	3.9	3.5	3.1	2.9	2.5

OCTOBER, 1903.

Day of Month..	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Hours	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
0	2.9	2.6	2.3	2.4	2.2	2.3	2.5	2.6	3.2	3.8	4.1	4.1	4.0	3.8	3.7	3.3
1	3.2	2.9	2.7	2.7	2.2	2.1	2.2	2.1	2.5	3.1	3.5	3.7	3.9	4.0	4.2	3.9
2	3.6	3.4	3.1	3.1	2.6	2.3	2.2	2.0	2.2	2.6	2.9	3.1	3.4	3.9	4.5	4.4
3	3.9	3.8	3.7	3.7	3.2	2.9	2.5	2.2	2.1	2.2	2.4	(2.5)	2.9	3.5	4.4	4.6
4	3.9	4.0	4.1	4.3	3.8	3.5	3.2	2.7	(2.3)	2.2	2.2	(2.1)	2.3	3.0	4.0	4.4
5	3.7	4.0	4.3	4.7	4.3	4.2	3.9	3.4	(3.0)	2.5	2.3	(1.9)	1.9	2.5	3.4	3.9
6	3.3	3.7	4.2	4.7	4.7	4.7	4.5	4.2	(3.7)	3.2	2.7	(2.0)	1.6	2.0	2.8	3.2
7	2.9	3.3	(3.9)	4.5	4.7	5.0	5.0	4.7	4.5	3.9	3.3	2.5	1.7	1.9	2.3	2.7
8	2.5	2.8	(3.5)	4.0	4.4	4.9	5.1	5.1	5.1	4.6	4.1	3.0	2.2	2.0	2.0	2.1
9	2.3	2.5	(3.0)	3.5	3.8	4.5	4.8	5.0	5.4	5.2	4.7	3.7	2.8	2.3	2.0	1.9
10	2.2	2.1	(2.6)	2.9	3.2	3.8	4.2	4.6	5.3	5.4	5.1	4.3	3.5	3.0	2.4	1.9
11	2.4	2.1	(2.2)	2.5	2.6	3.2	3.5	4.0	4.8	5.2	5.2	4.7	4.1	3.6	3.0	2.4
Noon	2.8	2.4	(2.2)	2.3	2.2	2.6	2.8	3.2	4.1	4.7	4.8	4.7	4.4	4.3	3.6	3.0
13	3.2	2.9	(2.7)	2.5	2.1	2.3	2.3	2.5	3.4	4.0	4.2	4.4	4.5	4.7	4.3	3.7
14	3.8	3.4	(3.3)	2.8	2.3	2.3	2.1	2.1	2.7	3.3	3.5	3.9	4.2	4.8	4.7	4.3
15	4.2	4.0	(3.9)	3.4	2.8	2.6	2.2	2.1	2.4	2.8	2.9	3.2	3.6	4.6	4.8	4.8
16	4.4	4.3	(4.4)	4.0	3.4	3.2	2.7	2.4	2.4	2.4	2.5	2.5	3.0	4.1	4.6	4.9
17	4.3	4.5	(4.8)	4.5	4.0	3.9	3.3	2.9	2.6	2.4	2.2	2.1	2.4	3.5	4.0	4.6
18	3.9	4.3	4.8	4.8	4.5	4.4	4.0	3.5	3.1	2.8	2.4	2.0	2.0	2.8	3.3	4.0
19	3.4	3.9	4.5	4.6	4.7	4.8	4.5	4.1	3.8	3.4	2.7	2.0	1.8	2.4	2.6	3.3
20	2.9	3.3	4.0	4.2	4.5	4.8	4.7	4.5	4.3	4.0	3.3	2.3	1.9	2.1	2.1	2.6
21	2.5	2.8	3.4	3.6	4.0	4.3	4.5	4.6	4.7	4.5	3.8	2.8	2.3	2.3	2.0	2.1
22	2.3	2.4	2.9	3.0	3.3	3.8	3.9	4.4	4.7	4.7	4.2	3.4	2.8	2.6	2.1	1.9
23	2.3	2.2	2.5	2.5	2.7	3.1	3.3	3.8	4.4	4.6	4.4	3.8	3.4	3.1	2.6	2.0

OCTOBER, 1903.—Continued.

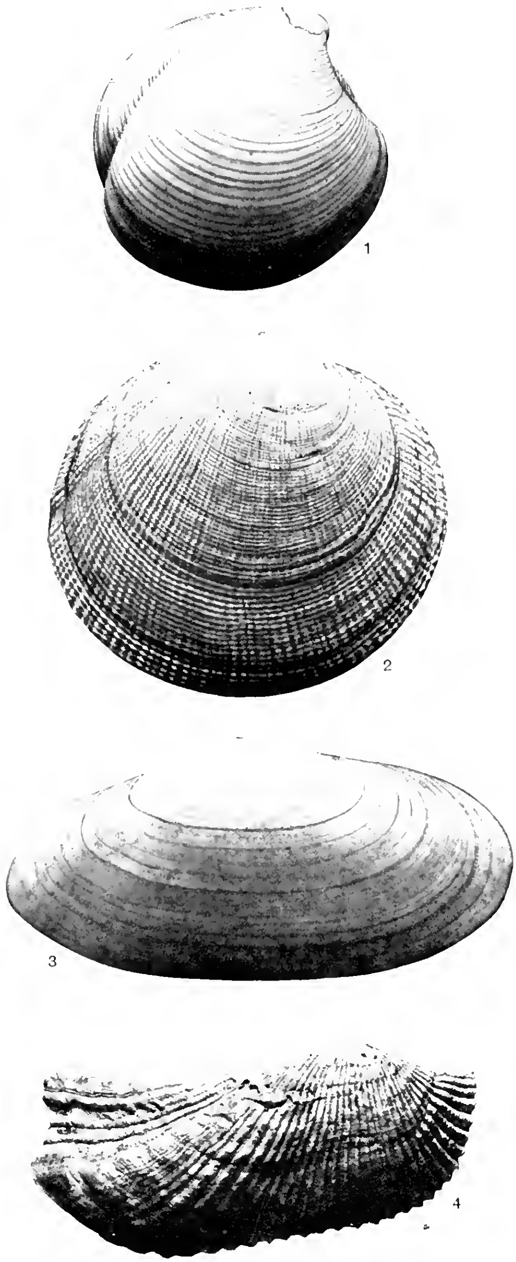
Day of Month......	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Hours	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
0	(2.4)	(2.0)	1.6	1.7	(2.0)	2.6	3.0	3.5	3.6	3.6	3.6	3.5	3.5	3.0	2.6
1	(3.3)	(2.8)	1.8	1.6	(1.6)	1.9	2.4	3.0	3.2	3.3	3.5	3.7	3.7	3.4	3.1
2	(4.3)	(3.7)	2.4	2.0	(1.7)	1.7	1.9	2.4	2.6	2.8	3.2	3.6	3.8	3.7	3.6
3	(4.8)	(4.5)	3.2	2.6	(2.2)	1.9	1.8	2.0	2.1	2.3	2.8	3.3	3.7	3.8	3.9
4	(5.0)	(5.0)	4.1	(3.4)	(3.0)	2.3	2.1	1.9	1.9	2.1	2.4	2.9	3.4	3.7	3.9
5	(4.8)	(5.1)	(5.0)	(4.4)	(4.0)	3.1	2.6	2.2	1.9	1.9	2.1	2.5	3.0	3.5	3.8
6	(4.3)	(4.9)	(5.2)	(5.2)	(4.8)	4.0	3.5	2.8	2.2	2.0	2.0	2.3	2.7	3.1	3.4
7	3.6	(4.4)	5.1	(5.3)	(5.3)	4.7	4.3	3.5	2.7	2.4	2.1	2.2	2.4	2.6	2.9
8	2.8	3.5	4.5	(5.0)	(5.4)	5.2	4.9	4.1	3.3	2.9	2.5	2.3	2.3	2.3	2.5
9	2.2	2.6	3.7	4.5	(5.0)	5.2	5.2	4.7	4.0	3.4	2.9	2.6	2.4	2.2	2.2
10	1.9	2.0	2.9	3.6	4.4	4.8	5.1	5.0	4.4	3.9	3.4	3.0	2.7	2.3	2.1
11	1.8	1.7	2.0	2.7	3.7	4.1	4.6	4.8	4.5	4.3	3.8	3.5	3.0	2.6	2.2
Noon	2.2	1.7	1.6	2.1	2.7	3.3	4.0	4.1	4.3	4.3	4.0	3.9	3.5	3.0	2.5
13	2.8	2.0	1.7	1.7	2.1	2.5	3.2	3.7	3.8	4.0	4.0	4.1	3.8	3.4	3.0
14	3.5	2.7	2.1	1.8	1.8	2.0	2.5	3.0	3.1	3.4	3.7	4.1	4.0	3.8	3.4
15	4.3	3.5	2.7	2.3	2.0	1.8	2.1	2.5	2.6	2.9	3.3	3.8	4.0	4.0	3.9
16	4.8	4.3	3.5	3.1	2.5	2.1	2.0	2.1	2.1	2.5	2.9	3.4	3.8	4.0	4.0
17	4.9	4.7	4.3	3.9	3.2	2.6	2.3	2.0	1.9	2.2	2.5	3.0	3.4	3.7	3.9
18	4.6	4.8	4.8	4.5	3.9	3.3	2.7	2.2	2.0	2.0	2.3	2.7	2.9	3.2	3.5
19	4.4	4.4	4.9	4.9	4.5	3.9	3.4	2.7	2.2	2.1	2.0	2.3	2.5	2.7	3.0
20	3.3	3.7	4.4	4.8	4.7	4.4	3.9	3.3	2.7	2.4	2.2	2.3	2.2	2.4	2.4
21	2.4	3.0	3.7	(4.1)	4.7	4.5	4.2	3.7	3.1	2.8	2.5	2.5	2.1	2.1	2.0
22	1.9	2.2	2.9	(3.4)	4.0	4.3	4.3	4.0	3.5	3.2	2.9	2.7	2.3	2.0	1.8
23	1.7	1.6	2.1	(2.7)	3.3	3.7	4.0	4.0	3.7	3.5	3.3	3.1	2.6	2.2	1.8

NOVEMBER, 1903.

Day of Month..	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Hours	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
0	2.2	1.9	1.6	1.5	1.7	(1.8)	2.2	2.6	3.2	3.8	4.0	3.8	3.4	2.8	2.2	1.7
1	2.6	2.3	1.9	1.6	1.6	(1.5)	1.6	1.9	2.5	3.3	3.8	4.0	3.9	3.5	3.0	2.3
2	3.1	2.9	2.5	2.1	1.9	(1.5)	1.5	1.5	2.0	2.6	3.3	3.9	4.1	4.0	3.7	3.0
3	3.6	3.5	3.1	2.8	2.5	(2.0)	1.6	1.3	1.6	2.0	2.7	3.3	4.0	4.3	4.3	3.8
4	3.9	4.0	3.8	3.6	3.3	(2.8)	2.1	1.6	1.5	1.6	2.1	2.8	3.6	4.2	4.6	4.5
5	3.9	4.3	4.2	4.3	4.1	(3.5)	2.9	2.1	1.6	1.6	1.8	2.2	2.9	3.8	4.5	4.8
6	3.6	4.1	4.4	4.7	4.8	(4.3)	3.8	2.9	2.2	1.7	1.6	1.8	2.4	3.2	3.9	4.6
7	3.1	3.8	4.2	4.7	5.0	(4.8)	4.5	3.7	3.0	2.2	1.9	1.7	1.9	2.6	3.3	4.0
8	2.6	3.2	3.6	4.3	4.8	(5.0)	4.9	4.4	3.8	2.9	2.3	1.8	1.7	2.0	2.6	3.3
9	2.1	2.6	3.0	3.7	4.3	(4.7)	5.0	4.8	4.4	3.7	2.9	2.2	1.8	1.8	2.0	2.6
10	1.9	2.1	2.4	2.9	3.6	(3.9)	4.7	4.8	4.8	4.3	3.6	2.8	2.1	1.8	1.7	2.0
11	1.8	1.8	1.9	2.3	2.8	(3.0)	4.0	4.4	4.8	4.7	4.3	3.4	2.7	2.1	1.7	1.6
Noon	2.0	1.8	1.6	1.9	2.1	(2.2)	3.2	3.7	4.3	4.6	4.6	4.0	3.3	2.6	2.0	1.6
13	2.4	2.0	1.7	1.7	1.7	(1.8)	2.4	2.8	3.6	4.2	4.5	4.3	3.9	3.3	2.6	2.0
14	3.0	2.5	2.1	2.0	1.7	1.7	1.8	2.0	2.8	3.5	4.0	4.3	4.2	3.8	3.3	2.6
15	3.4	3.2	2.7	2.5	2.1	1.8	1.5	1.6	2.1	2.8	3.4	4.0	4.3	4.2	3.9	3.3
16	3.8	3.7	3.3	3.1	2.7	2.2	1.6	1.5	1.7	2.2	2.8	3.4	3.9	4.2	4.3	3.9
17	4.0	4.0	3.8	3.8	3.3	2.8	2.0	1.6	1.6	1.8	2.2	2.8	3.3	3.9	4.2	4.3
18	3.8	4.0	4.0	4.2	3.9	3.5	2.6	2.0	1.7	1.7	1.8	2.1	2.7	3.3	3.8	4.2
19	3.3	3.6	3.9	4.3	4.2	4.0	3.3	2.7	2.2	1.9	1.6	1.7	2.1	2.6	3.2	3.8
20	2.7	3.1	3.5	4.0	4.2	4.3	3.8	3.2	2.8	2.3	1.8	1.5	1.6	1.9	2.5	3.1
21	2.2	2.5	2.8	3.4	3.7	4.1	4.0	3.7	3.4	2.8	2.2	1.7	1.5	1.6	1.8	2.5
22	1.8	2.0	2.2	2.8	3.1	3.7	3.8	3.9	3.8	3.4	2.8	2.1	1.7	1.4	1.5	1.7
23	1.6	1.6	1.7	2.1	2.4	3.0	3.3	3.7	4.0	3.8	3.4	2.8	2.2	1.7	1.4	1.5

NOVEMBER, 1903.—Continued.

Day of Month	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Hours	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
0	1.6	1.6	1.6	2.1	2.4	2.8	3.4	3.6	3.6	3.7	3.7	3.2	3.1	2.6
1	1.9	1.6	1.4	1.7	1.9	2.3	2.8	3.2	3.4	3.7	3.9	3.6	3.6	3.2
2	2.6	1.9	1.6	1.6	1.6	2.0	2.3	2.7	3.0	3.4	3.8	3.8	4.0	3.8
3	3.5	2.7	2.1	1.8	1.6	1.8	2.0	2.3	2.5	3.0	3.6	3.8	4.2	4.1
4	4.3	3.5	2.9	2.4	2.0	1.9	1.9	2.0	2.2	2.7	3.1	3.5	4.0	4.2
5	4.9	4.3	3.8	3.1	2.6	2.3	2.1	2.0	2.0	2.3	2.7	3.1	3.7	4.0
6	5.0	(4.8)	4.6	4.0	3.3	2.9	2.6	2.3	2.1	2.2	2.5	2.6	3.2	3.6
7	4.8	5.0	5.0	4.6	4.0	3.5	3.2	2.7	2.3	2.3	2.3	2.3	2.8	3.1
8	4.3	4.7	5.0	4.9	4.5	4.2	3.8	3.2	2.7	2.5	2.3	2.2	2.4	2.5
9	3.4	4.0	4.6	4.8	4.7	4.6	4.3	3.7	3.3	2.9	2.5	2.2	2.2	2.2
10	2.6	3.3	3.9	4.4	4.5	4.6	4.6	4.2	3.7	3.4	2.9	2.5	2.3	2.0
11	2.0	2.4	3.1	3.7	3.9	4.4	4.6	4.4	4.1	3.9	3.3	2.9	2.5	2.2
Noon	1.7	1.8	2.4	2.9	3.2	3.9	4.2	4.3	4.2	4.2	3.7	3.3	3.0	2.5
13	1.8	1.6	1.8	2.2	2.5	3.2	3.5	3.8	4.0	4.2	4.0	3.7	3.5	3.0
14	2.2	1.7	1.7	1.9	2.0	2.6	2.9	3.2	3.5	3.9	4.0	3.9	3.8	3.5
15	2.8	2.1	1.9	1.8	1.7	2.0	2.4	2.7	3.0	3.5	3.7	3.9	4.0	3.8
16	3.5	2.8	2.4	2.0	1.8	1.9	2.1	2.3	2.5	3.0	3.3	3.7	3.9	4.0
17	4.0	3.4	3.0	2.5	2.0	2.0	2.0	2.0	2.1	2.6	2.9	3.2	3.6	3.9
18	4.4	3.9	3.6	3.0	2.9	2.3	2.2	2.0	2.0	2.2	2.4	2.6	3.0	3.4
19	4.2	4.1	4.0	3.5	3.1	2.8	2.5	2.2	2.0	2.0	2.1	2.2	2.5	2.9
20	3.7	4.0	4.1	3.8	3.5	3.3	2.9	2.5	2.3	2.2	2.0	2.0	2.0	2.4
21	3.1	3.4	3.8	3.9	3.9	3.7	3.3	2.9	2.7	2.5	2.0	2.0	1.8	2.0
22	2.4	2.8	3.3	3.6	3.8	3.9	3.7	3.3	3.1	2.9	2.3	2.2	1.9	1.7
23	1.8	2.0	2.6	3.0	3.4	3.7	3.8	3.5	3.5	3.3	2.8	2.6	2.1	1.8



BAHAMA FOSSILS

DECEMBER, 1903.

Day of Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Hours	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
0	2.1	1.6	1.4	1.3	1.3	1.6	2.3	(3.1)	3.7	(4.2)	4.0	3.4	2.9	(2.0)	1.7	(1.3)
1	2.8	2.1	1.7	1.2	1.0	1.1	1.6	(2.3)	3.1	(3.9)	4.2	3.9	3.6	(2.8)	2.4	(1.7)
2	3.5	2.8	2.3	1.6	1.1	0.9	1.2	(1.8)	2.4	(3.1)	3.9	4.1	4.2	(3.7)	3.2	(2.7)
3	4.0	3.5	3.0	2.4	1.6	1.1	1.0	(1.3)	1.8	(2.4)	3.4	4.0	4.4	(4.4)	3.8	(3.5)
4	4.4	4.2	3.9	3.3	2.5	1.7	1.3	(1.2)	1.5	(1.9)	(2.7)	3.6	4.1	(4.5)	4.4	(4.1)
5	4.5	4.6	4.5	4.2	3.5	2.6	2.0	(1.6)	1.5	(1.5)	(2.0)	2.9	3.7	(4.3)	4.5	(4.6)
6	4.1	4.5	4.7	4.7	4.2	3.6	2.9	(2.5)	1.8	(1.5)	(1.5)	2.3	2.9	(3.8)	4.2	(4.6)
7	3.7	4.2	4.7	5.0	4.8	4.4	3.9	3.2	2.4	1.9	1.6	1.9	2.3	(3.0)	3.7	(4.4)
8	3.1	3.5	4.2	4.7	5.0	4.9	4.7	4.0	3.3	2.4	1.8	1.7	1.8	(2.3)	3.0	(3.8)
9	2.5	2.9	3.5	4.1	4.7	4.8	5.1	4.7	4.1	3.1	2.3	1.8	1.6	(1.8)	2.3	(3.1)
10	2.0	2.3	2.6	3.3	3.9	4.4	(4.9)	5.0	4.6	3.8	2.9	2.2	1.7	(1.6)	1.8	(2.4)
11	1.9	1.8	2.0	2.4	3.0	3.5	(4.3)	4.8	4.9	4.4	3.5	2.7	2.0	(1.7)	1.6	(1.7)
Noon	2.0	1.7	1.6	1.7	2.1	2.6	(3.4)	4.1	4.8	4.6	4.0	3.3	2.5	(2.2)	1.7	1.6
13	2.3	1.9	1.5	1.6	1.6	1.9	(2.6)	3.3	4.1	4.4	4.2	3.7	3.1	(2.7)	2.0	1.7
14	2.8	2.3	1.7	1.5	1.2	1.3	(1.9)	2.4	3.4	3.8	3.9	4.0	3.6	(3.3)	2.5	2.0
15	3.3	2.9	2.2	1.8	1.2	1.1	(1.4)	1.7	2.6	3.1	3.4	3.9	3.9	(3.7)	3.1	2.6
16	3.7	3.5	2.9	2.4	1.7	1.1	(1.2)	1.4	1.9	2.1	2.8	3.5	3.8	(3.9)	3.6	3.2
17	3.9	3.9	3.5	3.1	2.3	1.8	(1.5)	1.3	1.6	1.7	2.4	3.0	3.4	3.7	3.9	3.7
18	3.7	4.0	3.8	3.7	3.1	2.5	(2.2)	1.7	1.5	1.4	1.6	2.4	2.8	3.3	3.7	3.9
19	3.2	3.7	3.8	3.9	3.7	3.2	(2.7)	2.2	1.8	1.3	1.3	1.8	2.1	2.6	3.4	3.6
20	2.6	3.1	3.5	3.9	4.0	3.8	(3.4)	2.9	(2.3)	1.6	1.3	1.5	1.6	2.0	2.8	3.1
21	2.0	2.5	2.9	3.3	3.7	4.0	(4.0)	3.6	(3.0)	2.1	1.6	1.3	1.3	1.5	2.0	2.5
22	1.6	1.8	2.1	2.5	3.1	3.8	(4.1)	4.0	(3.6)	2.8	2.0	1.6	1.2	1.3	1.6	1.9
23	1.5	1.5	1.6	1.9	2.3	3.0	(3.8)	4.1	(4.1)	3.5	2.7	2.2	(1.4)	1.3	(1.2)	1.5

DECEMBER, 1903.—Continued.

Day of Month	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Hours	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
0	1.3	1.4	1.5	1.8	2.2	2.7	3.2	(3.4)	(3.6)	(3.7)	3.4	3.2	2.8	2.3	1.6
1	1.6	1.3	1.3	1.5	1.6	2.1	2.7	(3.1)	(3.3)	(3.7)	3.6	3.6	3.3	2.9	2.3
2	2.1	1.6	1.3	1.3	1.3	1.7	2.2	(2.7)	(3.0)	(3.4)	3.5	3.7	3.6	3.5	3.0
3	2.9	2.1	1.7	(1.5)	1.2	1.5	1.8	(2.2)	(2.6)	(3.0)	3.2	3.7	3.8	4.0	3.7
4	3.7	2.9	2.4	(2.0)	1.6	1.5	1.7	(2.0)	(2.3)	(2.5)	2.8	3.4	3.7	4.1	4.1
5	4.4	3.7	3.1	(2.7)	2.1	1.8	1.9	(1.9)	(2.0)	(2.1)	2.4	2.9	3.4	4.0	4.3
6	4.7	4.4	3.9	(3.4)	2.8	2.4	2.2	(2.1)	(2.1)	(2.0)	2.1	2.4	2.9	3.5	4.1
7	4.7	4.7	4.4	4.0	3.5	3.0	2.7	(2.5)	(2.3)	(2.1)	1.9	(1.9)	2.4	3.0	3.5
8	4.2	4.6	4.6	4.4	4.0	3.6	3.2	(3.0)	(2.7)	(2.3)	2.0	(1.8)	2.0	2.4	2.9
9	3.5	4.0	4.4	4.4	4.3	4.1	3.7	(3.5)	(3.1)	(2.7)	2.2	(1.9)	1.8	2.0	2.3
10	2.8	3.2	3.7	4.0	4.2	4.3	4.1	(3.9)	(3.6)	(3.1)	2.5	(2.2)	1.8	1.8	1.7
11	2.0	2.5	3.0	3.4	3.7	4.1	4.1	(4.1)	(3.9)	(3.4)	2.9	(2.6)	2.0	1.8	1.5
Noon	1.6	1.9	2.2	2.6	3.1	3.5	3.8	(3.9)	(4.0)	(3.7)	3.3	(3.0)	2.4	2.0	1.6
13	1.5	1.5	1.6	2.0	2.4	2.8	3.2	(3.5)	(3.8)	3.8	3.5	(3.4)	2.8	2.4	1.8
14	1.7	1.4	1.4	1.5	1.7	2.1	2.5	(3.0)	(3.3)	3.5	3.5	(3.6)	3.2	2.9	2.3
15	2.0	1.7	1.4	1.4	1.4	1.6	1.9	(2.5)	(2.8)	3.1	3.1	(3.5)	3.4	3.3	2.8
16	2.7	(2.3)	1.8	1.6	1.4	1.4	1.6	(2.1)	(2.4)	2.7	2.8	(3.2)	3.4	3.5	3.2
17	3.3	(2.9)	2.3	2.0	1.6	1.6	1.6	(1.8)	(2.0)	2.2	2.3	2.7	3.0	3.4	3.5
18	3.7	3.4	2.8	2.5	2.0	1.9	1.7	(1.8)	(1.9)	1.9	1.9	2.0	2.5	3.0	3.3
19	3.8	3.7	3.2	3.0	2.6	2.4	2.0	(2.1)	(1.9)	1.7	1.6	1.7	2.0	2.4	2.8
20	3.5	3.7	3.5	3.4	3.0	2.9	2.5	(2.6)	(2.2)	1.9	1.6	1.5	1.6	1.7	2.1
21	3.0	3.3	3.4	3.6	3.4	3.3	2.9	(3.0)	(2.6)	2.3	1.7	1.5	1.4	1.4	1.6
22	2.3	2.7	3.0	3.3	3.4	3.6	3.3	(3.4)	(3.1)	2.7	2.2	1.8	1.4	1.2	1.2
23	1.6	2.0	2.4	2.8	3.2	3.5	3.5	(3.6)	(3.5)	3.1	2.7	2.2	1.7	1.2	1.0

JANUARY, 1904.

Day of Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Hours	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
0	1.0	0.9	1.1	1.5	2.0	2.9	3.5	4.3	4.3	3.8	3.1	2.6	2.0	1.6	1.1	0.9
1	1.6	1.1	0.9	1.1	1.4	2.0	2.8	3.9	4.3	4.1	3.7	3.3	2.7	2.1	1.5	1.1
2	2.3	1.7	1.1	0.9	0.9	1.5	2.1	3.3	3.8	4.1	4.1	3.9	3.4	2.9	2.0	1.6
3	3.2	2.7	1.9	1.2	0.9	1.0	1.5	2.6	3.2	3.8	4.1	4.2	4.0	3.6	2.7	2.2
4	3.9	3.6	2.9	2.1	1.3	1.0	1.1	1.9	2.5	3.1	3.8	4.2	4.3	4.1	3.4	3.0
5	4.3	4.4	3.9	3.1	2.1	1.5	1.2	1.6	1.9	2.5	3.2	3.9	4.3	4.3	4.0	3.7
6	4.4	4.8	4.6	4.1	3.0	2.3	1.6	1.6	1.6	1.9	2.6	3.3	3.9	4.2	4.1	4.2
7	4.1	4.8	5.0	4.8	3.9	3.1	2.2	2.0	1.7	1.6	2.0	2.7	3.3	3.8	4.0	4.3
8	3.5	4.4	4.9	5.1	4.7	3.9	3.0	2.5	1.9	1.6	1.7	2.1	2.7	3.2	3.4	4.1
9	2.8	3.7	4.4	5.0	5.0	4.5	3.8	3.3	2.5	1.8	1.6	1.7	2.1	2.6	2.8	3.6
10	2.0	2.8	3.5	4.8	4.9	4.8	4.4	3.9	3.1	2.2	1.8	1.6	1.7	2.0	2.1	2.9
11	1.5	2.0	2.6	3.5	4.2	4.4	4.6	4.4	3.7	2.8	2.2	1.7	1.5	1.6	1.5	2.2
Noon	1.4	1.5	1.7	2.5	3.2	3.7	4.2	4.5	4.1	3.3	2.7	2.1	1.7	1.5	1.2	1.6
13	1.4	1.3	1.4	1.6	2.2	2.8	3.5	4.1	4.1	3.6	3.2	2.6	2.1	1.6	1.2	1.4
14	1.9	1.5	1.2	1.3	1.5	2.0	2.8	3.4	3.8	3.7	3.6	3.1	2.6	2.0	1.5	1.5
15	2.4	1.9	1.5	1.1	1.0	1.3	2.0	2.7	3.2	3.4	3.7	3.5	3.1	2.6	2.0	1.9
16	3.1	2.7	2.1	1.5	1.0	1.0	1.5	2.0	2.6	3.0	3.4	3.6	3.5	3.0	2.5	2.4
17	3.6	3.4	2.9	2.1	1.4	1.0	1.2	1.6	2.0	2.3	3.0	3.4	3.6	3.4	3.0	2.9
18	3.8	3.8	3.6	2.8	2.0	1.5	1.3	1.4	1.4	1.6	2.4	2.9	3.3	3.3	3.3	3.3
19	3.4	3.9	4.1	3.5	2.7	2.1	1.7	1.4	1.3	1.2	1.8	2.3	2.8	3.0	3.2	3.5
20	2.9	3.5	4.1	3.9	3.4	2.9	2.4	1.9	1.4	1.0	1.4	1.7	2.2	2.5	2.8	3.3
21	2.1	2.9	3.7	3.9	3.9	3.6	3.2	2.5	1.9	1.2	1.2	1.3	1.7	1.9	2.3	2.9
22	1.5	2.1	3.0	3.5	3.9	4.0	3.9	3.3	2.5	1.7	1.4	1.2	1.3	1.4	1.6	2.3
23	1.1	1.5	2.1	2.7	3.5	4.0	4.3	3.9	3.2	2.4	1.9	1.4	1.3	1.1	1.2	1.7

JANUARY, 1904.—Continued.

Day of Month	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Hours	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
0	1.2	1.7	2.0	2.3	2.7	3.4	3.5	3.7	3.7	3.5	3.3	2.8	2.1	1.5	0.8
1	1.1	1.3	1.5	1.8	2.2	2.9	3.1	3.5	3.7	3.7	3.8	3.4	2.9	2.1	1.3
2	1.3	1.3	1.3	1.4	1.7	2.4	2.7	3.0	3.4	3.7	4.0	3.9	3.6	2.9	2.0
3	1.8	1.7	1.4	1.2	1.5	1.9	2.2	2.5	3.0	3.4	3.9	4.1	4.1	3.7	2.9
4	2.5	2.3	1.9	1.3	1.5	1.8	1.9	2.0	2.5	3.0	3.5	4.1	4.4	4.3	3.9
5	3.3	2.9	2.6	1.8	1.8	1.8	1.8	1.8	2.0	2.5	3.1	3.8	4.3	4.6	4.6
6	3.9	3.7	3.3	2.4	2.3	2.2	2.0	1.7	1.9	2.1	2.6	3.2	3.9	4.5	5.0
7	4.3	4.2	3.8	3.0	2.9	2.7	2.3	1.9	1.8	1.8	2.2	(2.6)	3.2	4.0	4.7
8	4.3	4.4	4.2	3.5	3.5	3.3	2.9	2.3	2.0	1.7	1.9	(2.1)	2.6	3.3	4.1
9	3.9	4.3	4.3	3.8	4.0	3.7	3.4	2.7	2.4	1.9	1.9	(1.8)	2.1	2.5	3.3
10	3.2	3.7	4.0	3.8	4.2	4.0	3.7	3.2	2.8	2.3	2.1	(1.7)	1.7	1.8	2.4
11	2.5	3.0	3.5	3.4	3.9	4.0	3.9	3.6	3.3	2.7	2.5	(2.0)	1.6	1.4	1.7
Noon	1.8	2.3	2.9	2.9	3.4	3.6	3.7	3.6	3.5	3.1	2.9	(2.4)	1.9	1.4	1.4
13	1.4	1.7	2.2	2.2	2.7	2.9	3.3	3.3	3.5	3.4	3.2	(2.9)	2.3	1.8	1.4
14	1.3	1.3	1.7	1.6	2.0	2.4	2.7	2.8	3.2	3.3	3.4	(3.3)	2.8	2.3	1.7
15	1.6	1.3	1.5	1.4	1.7	1.9	2.2	2.3	2.7	3.0	3.4	(3.5)	3.3	2.9	2.4
16	2.0	1.7	1.6	1.3	1.6	1.7	1.8	1.8	2.3	2.6	3.1	(3.6)	3.6	3.5	3.1
17	2.6	2.2	1.9	1.6	1.7	1.6	1.5	1.5	1.8	2.1	2.7	(3.5)	3.6	3.8	3.8
18	3.2	2.8	2.4	2.0	2.1	1.7	1.6	1.4	1.5	1.8	2.2	2.7	3.3	3.7	4.2
19	3.5	3.3	2.9	2.5	2.5	2.3	1.9	1.6	1.4	1.5	1.7	2.1	2.7	3.3	4.1
20	3.6	3.5	3.3	3.0	3.0	2.8	2.4	1.9	1.5	1.4	1.4	1.6	2.0	2.6	3.6
21	3.3	3.4	3.4	3.3	3.5	3.3	2.8	2.5	1.9	1.6	1.4	1.3	1.4	1.8	2.9
22	2.8	3.0	3.3	3.4	3.8	3.6	3.3	3.0	2.5	2.1	1.7	1.3	1.5	1.2	2.0
23	2.2	2.5	2.9	3.2	3.7	3.7	3.7	3.4	3.0	2.7	2.2	1.6	1.1	0.8	1.4

FEBRUARY, 1904.

Day of Month.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Hours	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
0	0.9	0.9	(1.7)	2.7	3.3	3.8	4.0	3.8	3.4	2.8	(2.3)	1.8	1.5	1.2	(1.3)	(1.6)
1	1.0	0.6	(1.0)	1.8	2.6	3.3	3.9	4.0	3.8	3.4	(3.1)	2.4	2.0	1.4	(1.2)	(1.3)
2	1.5	0.6	(0.6)	1.1	1.8	2.5	3.3	3.7	4.0	3.9	(3.7)	3.0	2.6	1.9	(1.4)	(1.4)
3	2.2	1.1	(0.8)	0.7	1.1	1.8	2.7	3.3	3.8	4.0	(4.0)	3.7	3.2	2.5	(2.0)	(1.7)
4	3.2	2.0	(1.3)	0.8	0.8	1.3	2.0	2.7	3.4	3.9	(4.2)	4.1	3.8	3.2	(2.8)	(2.5)
5	4.2	3.0	(2.2)	1.4	0.9	1.0	1.5	2.1	2.8	3.5	(4.0)	4.2	4.2	3.7	(3.6)	(3.2)
6	4.9	4.0	(3.2)	2.2	1.4	1.1	1.3	1.6	2.2	2.9	(3.5)	4.1	4.3	4.1	(4.0)	(3.8)
7	5.2	4.7	4.0	3.1	2.1	1.1	1.4	1.4	1.8	2.4	3.0	3.6	4.0	4.1	(4.2)	(4.2)
8	4.9	4.9	4.6	4.0	3.0	2.2	1.8	1.5	1.6	1.9	2.4	3.1	3.5	3.6	(4.0)	(4.3)
9	4.1	4.5	4.8	4.5	3.7	2.9	2.3	1.8	1.6	1.6	1.9	2.5	2.8	3.0	(3.5)	(3.9)
10	3.1	3.8	4.5	4.5	4.1	3.5	2.9	2.3	1.8	1.6	1.7	2.0	2.3	2.4	(3.0)	(3.3)
11	2.1	2.8	3.7	4.0	4.1	3.8	3.4	2.8	2.3	1.9	1.7	1.8	1.8	1.7	(2.3)	(2.7)
Noon	1.3	1.8	2.7	3.2	3.6	3.6	3.7	3.3	2.7	2.3	1.9	1.8	1.6	1.4	1.8	(2.1)
13	0.9	1.0	1.8	2.3	2.8	3.2	3.5	3.4	3.1	2.8	2.3	2.1	1.7	1.4	1.6	(1.6)
14	1.0	0.7	1.0	1.4	2.0	2.5	3.1	3.3	3.3	3.2	2.7	2.6	2.0	(1.6)	1.7	(1.5)
15	1.4	(0.9)	0.8	0.8	1.2	1.8	2.6	3.0	3.2	3.4	3.1	3.1	2.5	(2.1)	1.9	(1.6)
16	2.1	(1.4)	1.0	0.6	0.7	1.2	1.9	2.5	2.9	3.4	3.4	3.5	3.0	(2.7)	(2.6)	(2.0)
17	2.9	(2.3)	1.5	0.9	0.7	0.8	1.4	1.9	2.5	3.1	3.3	3.6	3.4	(3.2)	(3.1)	2.6
18	3.6	(3.2)	2.4	1.5	1.0	0.8	1.1	1.5	2.0	2.7	3.0	3.5	3.5	(3.6)	(3.6)	3.3
19	4.1	(3.9)	3.3	2.2	1.6	1.1	1.1	1.2	1.6	2.2	2.6	3.2	3.3	(3.6)	(3.9)	3.8
20	4.0	(4.3)	4.0	3.1	2.4	1.7	1.1	1.2	1.3	(1.7)	2.1	2.7	2.9	(3.3)	(3.8)	4.0
21	3.4	(4.1)	4.3	3.7	3.2	2.5	1.9	1.6	1.3	(1.4)	1.7	2.2	2.3	(2.9)	(3.4)	3.7
22	2.6	(3.6)	4.2	4.0	3.8	3.2	2.6	2.1	1.6	(1.5)	1.5	1.7	1.8	(2.3)	(2.8)	3.2
23	1.7	(2.7)	3.5	3.9	4.0	3.8	3.3	2.7	2.2	(1.8)	1.5	1.5	1.4	(1.8)	(2.2)	2.6

FEBRUARY, 1904. Continued.

Day of Month	17	18	19	20	21	22	23	24	25	26	27	28	29
Hours	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
0	2.0	2.2	2.5	3.1	3.5	3.8	3.9	3.8	3.6	3.0	2.5	1.7	(1.1)
1	1.6	1.7	1.9	2.5	3.0	3.5	3.6	3.8	3.9	3.6	3.2	2.4	(1.7)
2	1.4	1.3	1.5	2.0	2.4	3.0	3.2	3.6	4.0	4.1	3.9	3.2	(2.5)
3	1.6	1.3	1.3	1.6	2.0	2.5	2.6	3.2	3.7	4.2	4.3	3.9	(3.3)
4	2.0	1.7	1.4	1.6	1.7	2.0	2.1	2.7	3.3	3.9	4.4	4.4	(4.2)
5	2.7	2.2	1.9	1.9	1.8	1.8	1.7	2.2	2.7	3.4	(4.2)	4.5	(4.6)
6	3.4	2.9	2.5	2.4	2.1	1.8	1.6	1.9	2.2	2.8	(3.6)	4.2	(4.7)
7	4.0	3.5	3.1	3.0	2.5	2.1	1.7	1.8	1.9	2.2	2.9	(3.5)	(4.2)
8	4.3	3.9	3.6	3.5	3.0	2.5	2.0	1.9	1.8	1.8	2.3	(2.8)	(3.5)
9	4.2	4.0	3.9	3.9	3.5	3.0	2.5	2.2	(1.9)	1.6	1.8	(2.1)	(2.6)
10	3.7	3.7	3.8	4.0	3.8	3.5	2.9	2.6	(2.2)	1.7	1.6	(1.5)	(1.8)
11	3.0	3.1	3.4	3.8	3.7	3.6	3.3	3.1	(2.6)	2.1	1.6	(1.3)	(1.2)
Noon	2.4	2.5	2.8	3.3	3.3	3.5	3.4	3.4	(2.9)	2.5	2.0	(1.5)	(1.0)
13	1.7	1.8	2.2	2.7	2.8	3.2	3.2	3.5	(3.2)	3.0	2.5	(2.0)	(1.3)
14	1.4	1.4	1.7	2.0	2.3	2.7	2.8	3.3	(3.3)	3.3	3.0	(2.6)	1.9
15	1.4	1.2	1.4	1.6	1.8	2.2	2.3	2.9	(3.1)	3.5	3.4	(3.2)	2.6
16	1.7	1.4	1.4	1.5	1.5	1.7	1.8	2.4	(2.8)	3.4	3.6	(3.8)	3.4
17	2.3	1.9	1.7	1.7	1.5	1.4	1.4	1.9	(2.4)	3.0	3.5	(4.1)	4.1
18	2.9	2.4	2.2	2.1	1.7	1.4	1.3	1.6	(1.9)	2.5	3.1	(3.9)	4.4
19	3.4	3.0	2.9	2.7	2.2	1.8	1.4	1.5	(1.6)	1.9	2.5	(3.4)	4.1
20	3.8	3.5	3.4	3.3	2.9	2.3	1.8	1.7	(1.3)	1.6	1.9	(2.6)	3.5
21	3.8	3.7	3.8	3.8	3.4	2.9	2.3	2.0	(1.4)	1.4	1.4	(1.9)	2.7
22	3.4	3.5	3.8	4.0	3.9	3.4	2.9	2.5	(1.8)	1.5	1.1	(1.3)	1.8
23	2.9	3.1	3.6	3.9	4.0	3.8	3.4	3.1	(2.3)	1.9	1.2	(1.0)	1.6

MARCH, 1904.

Day of Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Hours	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
0	0.9	1.1	1.7	3.0	3.6	4.2	(4.5)	4.5	4.1	3.3	2.7	2.3	2.1	1.8	1.6	1.6
1	1.2	0.8	1.0	2.0	2.8	3.6	(4.0)	4.5	4.4	3.8	3.2	2.9	2.5	2.1	1.7	1.4
2	1.7	0.9	0.8	1.3	1.9	(2.9)	(3.5)	4.1	4.4	4.1	3.7	3.5	3.0	2.6	2.0	1.5
3	2.6	1.4	1.1	1.1	1.3	(2.2)	(2.8)	3.5	4.1	4.0	4.0	3.9	3.5	3.1	2.6	1.9
4	3.5	2.2	1.8	1.3	1.1	(1.7)	(2.2)	2.9	3.5	3.7	4.0	4.2	4.0	3.7	3.3	2.5
5	4.4	3.3	2.7	1.9	1.4	(1.4)	(1.8)	(2.3)	2.9	3.3	3.7	4.2	4.3	4.2	3.7	3.1
6	4.8	4.2	3.7	2.7	1.9	(1.6)	(1.6)	(1.9)	2.4	2.8	3.3	3.8	4.2	4.3	4.1	3.7
7	4.8	4.8	4.3	3.6	2.7	(2.2)	1.9	1.9	2.1	2.2	2.7	3.3	3.8	4.1	4.1	4.1
8	4.3	4.7	4.8	4.3	3.5	2.9	2.4	2.0	2.0	1.9	2.3	2.8	3.2	3.6	3.7	4.1
9	3.4	4.2	4.7	4.7	4.1	3.5	2.9	2.5	2.2	1.9	1.9	2.3	2.6	3.0	3.2	3.7
10	2.5	3.4	4.1	4.5	4.3	4.0	3.5	3.0	2.5	2.0	1.8	2.0	2.1	2.4	2.5	3.1
11	1.6	2.4	3.3	3.9	4.0	4.1	3.9	3.5	(2.8)	2.3	2.0	2.0	1.9	2.0	1.9	2.5
Noon	1.0	1.5	2.4	3.1	3.4	3.9	4.0	3.8	(3.2)	2.7	2.3	2.2	1.9	1.8	1.5	1.9
13	0.8	0.9	1.5	2.1	2.6	3.3	3.6	3.8	3.5	3.1	2.7	2.5	2.1	1.9	1.5	1.6
14	1.1	0.9	1.0	1.4	1.9	2.7	3.0	3.6	3.8	3.4	3.1	2.9	2.5	2.2	1.7	1.6
15	1.6	1.2	0.9	1.0	1.3	2.0	2.5	3.2	3.7	3.4	3.4	3.4	3.0	2.7	2.2	1.9
16	2.4	1.9	1.3	1.0	1.1	1.5	2.0	2.7	3.2	3.2	3.6	3.7	3.5	3.3	2.8	2.5
17	3.4	2.8	2.0	1.5	1.2	1.3	1.6	2.2	2.7	2.8	3.4	3.8	3.8	3.7	3.3	3.1
18	4.1	3.7	3.0	2.2	1.8	1.4	1.5	1.9	2.2	2.4	3.0	3.5	3.8	4.0	3.8	3.7
19	4.5	4.4	4.0	3.1	2.6	1.9	1.7	1.8	1.8	2.0	2.5	3.2	3.5	3.8	3.9	4.1
20	4.3	4.7	4.7	4.0	3.5	2.6	2.2	1.9	1.7	1.7	2.1	2.6	3.0	3.4	3.8	4.1
21	3.6	4.3	4.9	4.5	4.2	3.4	2.9	2.4	1.9	1.6	1.8	2.1	2.5	2.9	3.3	3.7
22	2.7	3.5	4.5	4.7	4.7	4.1	3.5	2.9	2.3	1.8	1.8	1.9	2.0	2.3	2.7	3.1
23	1.9	2.6	3.8	4.3	4.7	4.5	4.2	3.6	2.8	2.2	2.0	1.8	1.8	1.8	2.1	2.3

MARCH, 1904.—Continued.

Day of Month	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Hours	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
0	1.8	(2.3)	2.8	3.2	3.6	3.8	4.2	4.3	4.2	3.6	2.9	2.4	1.7	1.3	1.2
1	1.4	(1.7)	2.2	2.5	2.9	3.2	3.8	4.2	4.4	4.1	3.6	3.1	2.2	1.6	1.0
2	1.4	(1.4)	1.8	2.0	2.3	2.7	3.3	3.8	4.2	4.3	4.1	3.8	2.9	2.1	1.3
3	1.7	(1.5)	1.6	1.7	1.9	2.1	2.7	3.3	3.8	4.3	4.5	4.4	3.8	2.8	2.0
4	2.2	(1.8)	1.7	1.7	1.7	1.7	2.2	2.7	3.3	3.9	4.4	4.8	4.4	3.7	2.7
5	2.9	(2.5)	2.1	2.0	(1.9)	1.6	1.8	2.1	2.7	3.3	4.0	4.8	4.8	4.5	3.7
6	3.5	(3.2)	2.7	2.6	(2.2)	1.8	1.7	1.8	2.2	2.7	3.5	4.4	4.8	4.9	4.3
7	3.9	3.8	3.3	3.2	2.7	2.2	1.9	1.8	1.8	2.2	2.9	3.7	4.3	4.7	4.7
8	4.0	4.0	3.9	3.7	3.3	2.7	2.4	2.0	1.8	1.9	2.3	2.9	3.5	4.1	4.5
9	3.7	3.9	4.2	4.0	3.8	3.3	2.9	2.4	2.0	1.8	1.8	2.2	2.6	3.2	3.7
10	3.1	3.4	4.0	3.9	4.0	3.6	3.3	2.9	2.4	1.9	1.7	1.8	1.9	2.3	2.8
11	2.4	2.8	3.5	3.5	3.8	3.7	3.6	3.3	2.8	2.4	2.0	1.7	1.4	1.6	1.9
Noon	1.8	2.2	2.9	2.9	3.2	3.4	3.6	3.5	3.2	2.9	2.4	2.0	1.4	1.1	1.1
13	1.4	1.7	2.2	2.3	2.6	2.9	3.3	3.4	3.5	3.4	2.9	2.5	1.8	1.1	0.8
14	1.3	1.4	1.7	1.7	2.0	2.3	2.8	3.1	3.5	3.7	3.5	3.2	2.6	1.6	0.9
15	1.6	1.5	1.5	1.4	1.6	1.7	2.3	2.7	3.3	3.8	4.0	3.9	3.3	2.3	1.4
16	2.1	1.9	1.6	1.5	1.4	1.4	1.8	2.2	2.8	3.5	4.1	4.4	4.1	3.2	2.2
17	2.7	2.5	2.1	1.8	1.6	1.4	1.5	1.8	2.4	3.1	3.9	4.5	4.8	4.1	3.2
18	3.4	3.2	2.8	2.4	2.0	1.6	1.5	1.5	1.9	2.5	3.4	4.2	5.0	4.7	4.1
19	3.9	3.9	3.5	3.1	2.6	2.1	1.7	1.5	1.6	2.0	2.8	3.6	4.6	4.9	4.7
20	4.0	4.3	4.1	3.8	3.3	2.8	2.3	1.9	1.6	1.6	2.1	2.8	3.8	4.4	4.8
21	(3.8)	4.4	4.4	4.2	3.9	3.4	2.9	2.4	1.9	1.6	1.7	2.1	3.0	3.7	4.3
22	(3.4)	4.1	4.3	4.3	4.2	4.0	3.6	3.0	2.4	1.8	1.6	1.6	2.2	2.8	3.5
23	(2.9)	3.5	3.8	4.1	4.2	4.3	4.0	3.7	3.0	2.3	1.9	1.5	1.6	1.9	2.5

APRIL, 1904.

Day of Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Hours	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
0	1.6	2.5	3.2	3.8	4.2	4.2	4.1	3.8	3.3	2.9	2.3	1.9	1.8	1.9	1.9	2.0
1	1.1	1.7	2.3	3.0	3.7	3.9	4.2	4.1	3.7	3.3	2.8	2.3	2.0	2.0	1.7	1.6
2	0.9	1.2	1.6	2.3	3.0	3.4	3.9	4.1	4.0	3.8	3.3	2.8	2.4	2.3	1.9	1.6
3	1.2	1.1	1.2	1.6	2.4	2.9	3.4	3.8	4.0	4.0	3.7	3.3	3.0	2.8	2.3	1.9
4	1.8	1.4	1.1	1.3	1.8	2.3	2.9	3.5	3.8	4.0	3.9	3.8	3.6	3.3	2.9	2.3
5	2.7	2.0	1.4	1.3	1.6	1.9	2.4	2.9	3.4	3.8	3.8	4.0	4.0	3.8	3.5	2.9
6	3.6	2.8	2.0	1.7	1.6	1.6	2.0	2.5	2.8	3.4	3.4	3.8	4.1	4.2	4.0	3.6
7	4.3	3.5	2.8	2.3	1.9	1.7	1.9	2.1	2.4	2.8	2.9	3.5	3.9	4.1	4.1	4.0
8	4.5	4.1	3.5	3.0	2.4	2.0	2.0	1.9	2.0	2.4	2.4	2.9	3.4	3.8	3.9	4.0
9	4.2	4.2	4.0	3.6	2.9	2.5	2.3	2.0	2.0	2.0	2.0	2.4	2.9	3.2	3.4	3.7
10	3.4	3.8	4.0	3.8	3.4	2.9	2.7	2.3	2.1	1.9	1.7	1.9	2.3	2.6	2.8	3.1
11	2.5	3.0	3.5	3.8	3.7	3.3	3.1	2.7	2.4	2.0	1.7	1.7	1.9	2.1	2.2	2.4
Noon	1.6	2.2	2.9	3.3	3.6	3.5	3.5	3.1	2.7	2.3	1.9	1.7	1.8	1.8	1.7	1.9
13	1.0	1.4	2.1	2.7	3.1	3.4	3.6	3.4	3.1	2.7	2.3	2.1	2.0	1.8	1.4	1.5
14	0.8	1.0	1.5	2.0	2.6	3.1	3.5	3.6	3.5	3.2	2.8	2.5	2.3	2.1	1.6	1.5
15	1.0	0.8	1.1	1.5	2.0	2.6	3.2	3.5	3.6	3.5	3.3	3.1	2.9	2.7	2.0	1.8
16	1.6	1.1	1.0	1.3	1.6	2.1	2.8	3.2	3.5	3.6	3.6	3.6	3.5	3.3	2.7	2.4
17	2.5	1.8	1.4	1.4	1.4	1.8	2.4	2.8	3.3	3.5	3.8	3.9	4.1	3.9	3.3	3.1
18	3.5	2.7	2.0	1.8	1.4	1.6	2.1	2.4	2.9	3.2	3.6	4.0	4.4	4.4	4.1	3.9
19	4.4	3.7	2.9	2.3	1.8	1.7	1.9	2.1	2.4	2.8	3.2	3.7	4.3	4.5	4.4	4.4
20	4.9	4.4	3.7	3.0	2.4	2.1	2.0	1.9	2.1	2.3	2.7	3.3	3.9	4.2	4.4	4.7
21	4.8	4.8	4.4	3.7	3.1	2.7	2.4	2.0	2.0	2.0	2.1	2.7	3.3	3.7	4.0	4.6
22	4.3	4.6	4.7	4.2	3.7	3.3	2.8	2.3	2.1	1.8	1.8	2.2	2.7	3.0	3.3	4.0
23	3.4	4.1	4.4	4.4	4.1	2.8	3.4	2.8	2.4	2.0	1.7	1.9	2.2	2.3	2.6	3.3

APRIL, 1904.—Continued.

Day of Month	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Hours	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
0	2.6	3.1	3.8	4.1	4.4	4.7	4.4	3.7	(3.1)	(2.5)	1.7	1.4	1.5	1.8
1	2.0	2.4	3.1	3.4	3.9	4.5	4.6	4.2	(3.7)	(3.1)	2.3	1.7	1.4	1.4
2	1.7	1.9	2.4	2.8	3.2	4.0	4.4	4.4	(4.2)	(3.6)	3.1	2.2	1.7	1.4
3	1.7	1.7	2.0	2.2	2.6	3.4	3.9	4.2	(4.3)	(4.1)	(3.6)	3.0	2.3	1.8
4	2.1	1.9	1.8	1.8	2.0	2.7	3.3	3.7	(4.1)	(4.3)	(4.1)	3.8	3.1	2.4
5	2.6	2.3	2.1	1.8	1.7	2.4	2.6	3.1	(3.6)	(4.1)	(4.4)	4.3	3.8	3.2
6	3.3	2.9	2.5	2.1	1.7	1.9	2.0	2.4	(3.0)	(3.6)	(4.1)	4.5	4.4	3.8
7	3.8	3.6	3.0	2.6	2.1	1.9	1.8	1.9	(2.4)	(2.8)	3.7	4.3	4.5	4.3
8	4.1	4.1	3.6	3.1	2.6	2.1	1.7	1.5	(1.8)	(2.1)	3.0	3.6	4.2	4.3
9	4.0	4.3	4.0	3.6	3.1	2.6	2.0	1.5	(1.4)	(1.5)	2.1	2.8	3.5	3.9
10	3.7	4.0	4.0	3.8	3.6	3.1	2.5	1.9	(1.5)	(1.3)	1.5	2.0	2.6	3.2
11	3.0	3.5	3.7	3.8	3.9	3.5	3.0	2.4	(2.0)	(1.4)	1.2	1.3	1.9	2.3
Noon	2.4	2.9	3.2	3.5	3.9	3.8	3.5	2.9	(2.6)	1.8	(1.8)	1.1	1.3	1.6
13	1.8	2.3	2.6	2.9	3.5	3.8	3.8	3.4	(3.2)	2.5	(2.4)	1.3	1.1	1.2
14	1.5	1.8	2.0	2.3	3.0	3.4	3.8	(3.9)	(3.8)	3.3	(3.0)	1.9	1.5	1.2
15	1.5	1.6	1.6	1.7	2.5	2.9	3.5	(4.0)	(4.3)	4.1	(3.6)	2.7	2.1	1.6
16	1.9	1.8	1.6	1.5	2.0	2.4	3.0	(3.5)	(4.3)	4.5	(4.2)	3.6	3.0	2.2
17	2.6	2.3	1.9	1.5	1.7	2.0	2.4	(2.9)	(4.1)	4.5	(4.8)	4.5	4.0	3.2
18	3.4	3.1	2.4	1.9	1.8	1.7	2.0	(2.3)	(3.5)	4.2	(4.8)	5.0	4.8	4.2
19	4.1	3.8	3.2	2.4	2.1	1.8	1.6	(1.8)	(2.8)	3.5	4.5	5.0	5.2	4.9
20	4.6	4.5	4.0	3.2	2.7	2.0	1.6	(1.5)	(2.2)	2.7	3.8	4.6	5.1	5.2
21	4.7	4.8	4.5	3.8	3.4	2.6	1.9	(1.6)	(1.6)	2.0	2.9	3.7	4.5	5.0
22	4.4	4.8	4.8	4.4	4.0	3.3	2.4	(2.0)	(1.6)	1.5	2.1	2.9	3.6	4.3
23	3.9	4.4	4.6	4.6	4.5	3.9	3.0	(2.5)	(2.0)	1.4	1.6	2.0	2.6	3.5

MAY, 1904.

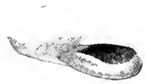
Day of Month..	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Hours	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
0	2.5	3.4	(3.6)	4.3	(4.4)	4.3	4.2	3.8	3.3	2.9	2.4	2.0	1.9	1.7	2.0	2.3
1	1.8	2.6	(3.0)	3.7	(3.9)	4.2	4.3	4.1	3.7	3.3	2.9	2.3	2.0	1.7	1.7	1.9
2	1.4	1.8	(2.5)	3.0	(3.3)	3.7	4.1	4.1	4.0	3.8	3.3	2.8	2.5	2.0	1.8	1.8
3	1.4	1.5	(2.0)	2.3	(2.8)	3.2	3.7	3.9	4.0	4.0	3.7	3.3	3.0	2.5	2.1	1.9
4	1.8	1.6	(1.6)	1.9	(2.4)	2.6	3.2	3.5	3.8	4.0	4.0	3.7	3.5	3.1	2.7	2.4
5	2.4	2.0	(2.0)	1.7	(2.0)	2.2	2.7	3.0	3.4	3.8	3.9	3.9	3.9	3.6	3.3	2.9
6	3.2	2.6	(2.4)	1.9	(1.8)	1.9	2.3	2.6	3.0	3.3	3.6	3.7	4.0	3.9	3.8	3.5
7	3.9	3.3	2.9	2.2	1.9	1.9	2.0	2.2	2.5	2.8	3.1	3.4	3.7	3.8	4.0	4.0
8	4.2	4.0	3.5	2.8	2.3	2.1	2.0	2.0	2.1	2.3	2.6	2.8	3.2	3.5	3.9	4.1
9	4.1	4.2	4.0	3.3	2.8	2.5	2.3	2.0	2.0	1.9	2.1	2.9	2.6	2.9	3.5	3.9
10	3.7	(3.8)	4.1	3.7	3.3	2.9	2.6	2.3	2.1	1.9	1.8	1.8	2.0	2.3	2.8	3.3
11	2.9	(3.2)	3.9	3.7	3.6	3.3	3.1	2.7	2.4	2.1	1.8	1.6	1.6	1.7	2.1	2.6
Noon	2.3	(2.5)	3.4	3.5	3.6	3.6	3.5	3.2	2.8	2.5	2.1	1.8	1.5	1.4	1.6	1.9
13	1.6	(2.1)	2.8	3.1	3.3	3.6	3.8	3.6	3.3	3.0	2.5	2.2	1.8	1.5	1.5	1.5
14	1.3	(1.7)	2.2	2.6	3.0	3.4	3.8	3.8	3.7	3.5	3.1	2.7	2.3	1.9	1.7	1.5
15	1.3	(1.4)	1.8	2.1	2.6	3.1	3.6	3.8	4.0	3.9	3.6	3.4	2.9	2.6	2.2	1.8
16	1.8	(2.2)	1.6	1.8	2.2	2.7	3.3	3.5	4.0	4.1	4.0	4.0	3.6	3.3	2.9	2.4
17	2.6	(3.0)	1.9	1.7	2.0	2.3	2.9	3.2	3.7	4.0	4.1	4.3	4.2	4.0	3.8	3.1
18	3.5	3.7	2.3	1.9	1.9	2.1	2.5	2.8	3.3	3.7	4.0	4.0	4.5	4.6	4.4	3.9
19	4.4	(4.1)	3.0	2.3	2.1	2.1	2.2	2.4	2.8	3.3	3.5	4.1	4.5	4.8	4.9	4.6
20	5.0	(4.5)	3.8	3.0	2.6	2.3	2.2	2.2	2.4	2.8	3.0	3.6	4.0	4.5	4.9	4.9
21	5.2	(4.8)	4.5	3.6	3.2	2.8	2.5	2.1	2.2	2.3	2.4	2.9	3.4	4.0	4.5	4.9
22	4.9	(4.8)	4.8	(4.1)	3.7	3.3	2.9	2.4	2.2	2.1	2.0	2.3	2.6	3.2	3.9	4.3
23	4.2	(4.3)	4.7	(4.6)	4.2	3.8	3.3	2.8	2.4	2.2	1.9	2.0	2.0	2.6	3.1	3.5

MAY, 1904.—Continued.

Day of Month......	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Hours	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
0	2.7	3.4	4.1	4.6	4.8	4.7	4.0	3.2	2.5	1.9	1.7	1.6	2.0	2.6	3.2
1	2.0	2.6	3.3	4.0	4.4	4.7	4.5	3.9	3.1	2.3	1.9	1.6	1.6	1.9	2.4
2	1.7	2.0	2.5	3.2	3.8	4.4	4.6	4.3	3.7	2.9	2.4	1.9	1.6	1.7	1.9
3	1.6	1.7	1.9	2.5	3.1	3.9	4.3	4.4	4.2	3.5	3.1	2.5	2.0	1.8	1.7
4	1.9	1.7	1.6	1.9	2.4	3.2	3.8	4.1	4.3	4.0	3.7	3.1	2.5	2.1	1.9
5	2.3	2.0	1.7	1.6	1.8	2.5	3.0	3.5	4.0	4.2	4.2	3.8	3.2	2.7	2.2
6	3.0	2.5	2.0	1.7	1.6	2.0	2.3	2.9	3.5	3.9	4.2	4.2	3.8	3.3	2.8
7	3.5	3.1	2.6	2.1	1.8	1.8	1.7	2.2	2.8	3.4	3.9	4.2	4.1	3.9	3.4
8	4.0	3.7	3.2	2.6	2.2	1.9	1.5	1.6	2.0	2.7	3.3	3.8	4.0	4.1	3.9
9	4.0	4.0	3.8	3.3	2.8	2.2	1.7	1.4	1.5	2.0	2.6	3.1	3.6	3.9	4.1
10	3.6	4.0	4.0	3.8	3.5	2.8	2.1	1.6	1.3	1.5	1.9	2.4	3.0	3.4	3.8
11	3.0	3.5	3.9	4.0	4.0	3.4	2.7	2.0	1.5	1.3	1.5	1.7	2.3	2.8	3.3
Noon	2.3	2.9	3.5	3.9	4.2	4.0	3.4	2.7	2.0	1.6	1.4	1.3	1.7	2.2	2.7
13	1.7	2.2	2.9	3.6	4.1	4.3	4.0	3.4	2.7	2.0	1.7	1.4	1.4	1.7	2.1
14	1.4	1.7	2.3	3.0	3.8	4.3	4.3	4.1	3.5	2.8	2.3	1.8	1.5	1.5	1.7
15	1.5	1.4	1.8	2.4	3.3	4.0	4.3	4.5	4.2	3.7	3.2	2.4	1.9	1.7	1.6
16	1.9	1.6	1.5	1.9	2.7	3.4	4.0	4.6	4.6	4.5	4.1	3.3	2.5	2.2	1.9
17	2.6	2.0	1.6	1.7	2.1	2.8	3.4	4.2	4.7	4.9	4.7	4.2	3.4	3.0	2.4
18	3.4	2.7	2.1	1.7	1.9	2.2	2.7	3.5	4.3	4.9	5.0	4.8	4.3	3.8	3.2
19	4.1	3.5	2.7	2.1	2.0	1.9	2.1	2.8	3.6	4.5	4.9	5.1	4.9	4.6	4.0
20	4.8	4.3	3.6	2.8	2.4	1.9	1.8	2.2	2.9	3.7	4.4	5.0	5.1	5.1	4.6
21	5.1	4.9	4.3	3.6	3.0	2.2	1.8	1.8	2.2	2.9	3.6	4.3	4.8	5.0	5.0
22	4.8	5.0	4.8	4.3	3.7	2.8	2.1	1.7	1.8	2.2	2.8	3.6	4.1	4.7	4.9
23	4.1	4.7	4.9	4.7	4.3	3.4	2.7	2.0	1.7	1.8	2.0	2.7	3.4	4.0	4.4

1

2



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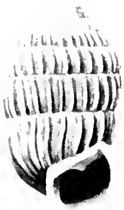

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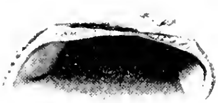

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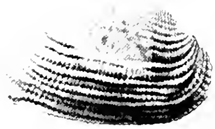


9

BAHAMA FOSSILS

JUNE, 1904.

Day of Month.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Hours	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
0	3.6	4.1	4.3	4.3	4.2	3.9	3.6	3.2	2.8	2.4	2.2	2.1	2.1	2.5	3.0	(3.6)
1	2.9	3.4	3.7	4.0	4.1	4.1	4.0	3.6	3.2	2.8	2.5	2.4	2.1	2.0	2.2	(3.0)
2	2.3	2.7	3.2	3.5	3.8	4.0	4.1	3.8	3.6	3.3	2.9	2.8	2.3	1.9	1.9	(2.4)
3	1.8	2.2	2.6	3.0	3.3	3.7	3.9	3.9	3.9	3.7	3.5	3.3	2.7	2.2	1.9	(1.9)
4	1.7	1.8	2.1	2.5	2.8	3.2	3.6	3.7	3.9	4.0	3.9	3.9	3.3	2.7	2.2	(1.7)
5	1.9	1.8	1.9	2.1	2.4	2.7	3.1	3.3	3.6	3.9	4.1	4.2	3.9	3.3	2.8	(2.0)
6	2.4	1.9	2.0	1.9	2.0	2.3	2.5	2.7	3.2	3.6	4.0	4.2	4.2	3.9	3.4	(2.4)
7	3.0	2.4	2.3	2.1	1.9	2.0	2.2	2.3	2.7	3.1	3.6	3.8	4.2	4.3	3.9	2.8
8	3.5	3.0	2.7	2.5	2.1	2.0	2.0	1.9	2.2	2.6	3.0	3.3	4.0	4.4	4.3	3.5
9	3.9	3.5	3.2	2.9	2.5	2.2	2.1	1.8	1.9	2.1	2.4	2.7	3.3	4.0	4.3	4.1
10	3.9	3.8	3.6	3.4	3.0	2.6	2.4	2.0	1.9	1.8	2.0	2.1	2.7	3.4	3.9	4.3
11	3.7	3.8	3.8	3.7	3.4	3.1	2.8	2.4	2.1	1.9	1.8	1.9	2.1	2.7	3.2	4.0
Noon	3.2	3.6	3.7	3.9	3.8	3.6	3.3	3.0	2.6	2.3	2.0	1.9	1.8	2.0	2.5	3.5
13	2.7	3.2	3.4	3.7	3.8	3.9	3.8	3.5	3.2	2.8	2.5	2.2	1.8	1.7	1.9	2.8
14	2.1	2.7	3.0	3.4	3.6	4.0	4.1	3.9	3.8	3.4	3.1	2.8	2.1	1.6	1.5	2.1
15	1.8	2.2	2.5	3.0	3.3	3.9	4.1	4.2	4.2	4.1	3.9	3.5	2.7	1.9	1.6	1.6
16	1.8	1.9	2.1	2.5	2.9	3.5	3.9	4.1	4.5	4.5	4.5	4.3	3.5	2.6	2.0	1.5
17	2.1	1.9	1.9	2.2	2.5	3.1	3.5	3.8	4.3	4.7	5.0	4.9	4.3	3.5	2.8	1.7
18	2.7	2.3	2.1	2.1	2.2	2.6	3.1	3.3	4.0	4.5	5.0	5.2	5.0	4.4	3.7	2.2
19	3.4	2.8	2.5	2.3	2.2	2.3	2.7	2.8	3.5	4.0	4.7	5.1	5.3	5.1	4.5	3.2
20	4.0	3.4	3.0	2.6	2.3	2.2	2.3	2.4	3.0	3.5	4.1	4.6	5.2	5.4	5.0	4.0
21	4.5	4.0	3.6	3.1	2.8	2.4	2.2	2.2	2.5	2.9	3.3	3.9	4.7	5.2	5.2	4.8
22	4.8	4.4	4.1	3.6	3.2	2.8	2.4	2.2	2.2	2.4	2.7	3.2	4.1	4.6	(5.0)	5.1
23	4.6	4.5	4.4	4.0	3.6	3.2	2.8	2.4	2.2	2.1	2.3	2.5	3.1	3.8	(4.3)	5.0

JUNE, 1904.—Continued.

Day of Month	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Hours	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
0	4.5	4.7	4.7	4.5	4.0	3.6	3.0	2.3	1.9	1.9	2.1	2.6	3.0	3.5
1	3.7	4.0	4.3	4.4	4.4	4.1	3.5	2.8	2.2	1.9	1.9	2.1	2.4	2.9
2	2.9	3.2	3.7	4.1	4.4	4.4	4.1	3.4	2.7	2.3	2.0	2.0	2.1	2.3
3	2.1	2.4	2.9	3.5	4.1	4.4	4.4	3.9	3.3	2.8	2.3	2.1	2.0	2.1
4	1.6	1.7	2.2	2.8	3.5	4.0	4.3	4.2	3.8	3.4	2.9	2.6	2.3	2.1
5	1.5	1.5	1.7	2.1	2.7	3.5	4.0	4.2	4.2	3.9	3.5	3.1	2.8	2.5
6	1.8	1.7	1.4	1.6	2.1	3.0	3.4	3.9	4.1	4.1	3.9	3.7	3.3	2.9
7	2.4	2.1	1.6	1.4	1.7	2.1	2.8	3.3	3.8	4.0	4.1	4.1	3.8	3.5
8	3.1	2.8	2.0	1.6	1.6	1.7	2.1	2.6	3.1	3.6	3.9	4.2	4.2	4.0
9	3.8	3.5	2.7	2.1	1.9	1.6	1.7	1.9	2.4	3.0	3.5	3.9	4.1	4.2
10	4.3	4.1	3.4	2.8	2.4	2.0	1.7	1.5	1.8	2.3	2.8	3.4	3.8	4.1
11	4.2	4.3	4.0	3.5	3.0	2.5	2.0	1.5	1.5	1.8	2.2	2.7	3.2	3.7
Noon	3.8	4.1	4.3	4.1	3.8	3.3	2.6	1.9	1.6	1.5	1.7	2.2	2.7	3.1
13	3.2	3.6	4.1	4.4	4.3	4.0	3.4	2.5	2.0	1.6	1.6	1.8	2.2	2.6
14	2.5	3.0	3.7	4.4	4.7	4.6	4.1	3.3	2.7	2.1	1.8	1.8	1.9	2.2
15	1.9	2.3	3.1	4.0	4.6	4.9	4.7	4.1	3.4	2.8	2.3	2.0	2.0	2.0
16	1.6	1.7	2.4	3.4	4.2	4.8	5.0	4.7	4.2	3.7	3.1	2.6	2.3	2.1
17	1.6	1.5	1.9	2.7	3.6	4.5	4.9	5.0	4.8	4.5	3.8	3.4	3.0	2.5
18	2.0	1.7	1.6	2.2	2.9	3.8	4.4	4.9	5.0	5.0	4.6	4.1	3.7	3.2
19	2.7	2.1	1.7	1.9	2.3	3.1	3.7	4.4	4.8	5.1	5.1	4.8	4.4	3.9
20	3.6	2.9	2.1	2.0	2.0	2.5	3.0	3.6	4.3	4.8	5.1	5.1	4.9	4.5
21	4.3	3.7	2.7	2.3	2.0	2.1	2.3	2.9	3.3	4.1	4.7	4.9	5.0	4.8
22	4.9	4.3	3.5	2.9	2.4	2.1	2.0	2.2	2.7	3.4	4.0	4.4	4.8	4.8
23	5.0	4.7	4.1	3.5	2.9	2.4	2.0	1.9	2.1	2.6	3.3	3.8	4.2	4.5

HIGH AND LOW WATERS.

Date.	High Waters.				Low Waters.			
	A. M.		P. M.		A. M.		P. M.	
1903.	Time.	Height.	Time.	Height.	Time.	Height.	Time.	Height.
	h. m.	Feet.	h. m.	Feet.	h. m.	Feet.	h. m.	Feet.
July 1	.. ..	. .	1 00	3.8	(6 30)	(1.0)	(7 10)	(1.7)
2	1 00	3.5	2 00	4.5	(7 30)	(1.3)	8 20	2.1
3	2 50	4.2	(3 05)	(4.6)	8 20	1.7	(9 25)	(2.1)
4	(3 25)*	(4.1)	4 10	4.6	9 40	1.6	10 30	2.1
5	4 00	3.9	4 40	4.7	10 20	1.6	11 15	2.0
6	5 00	3.8	5 53	4.7	11 10	1.6	.. ..	. .
7	6 00	3.8	6 20	4.8	0 00	1.9	11 50	1.7
8	6 20	3.9	6 50	4.8	0 35	2.0	12 20	1.7
9	7 10	3.9	7 45	4.8	1 15	2.0	1 00	1.7
10	8 00	4.0	(8 20)	(4.8)	2 10	2.0	2 00	1.9
11	8 20	4.0	8 50	4.7	(2 35)	(2.0)	2 10	1.9
12	8 50	4.1	9 15	4.7	3 00	2.0	2 50	2.0
13	9 40	4.2	10 00	4.6	3 50	2.0	3 30	2.1
14	10 50	4.1	10 45	4.5	4 30	2.0	4 30	2.1
15	11 40	4.3	11 50	4.4	5 10	2.0	5 15	2.3
16	.. ..	. .	12 15	4.5	5 50	2.2	6 15	2.4
17	0 20	4.3	1 00	4.5	6 50	2.0	7 10	2.4
18	1 00	4.2	2 00	4.5	7 20	2.0	8 10	2.3
19	2 00	4.1	3 00	4.8	8 15	1.9	9 10	2.3
20	3 00	4.2	3 55	5.0	9 10	1.8	10 15	2.2
21	4 00	4.2	4 50	5.2	10 15	1.6	11 15	1.9
22	5 00	4.3	5 40	5.4	11 00	1.4	.. ..	. .
23	6 00	4.5	6 30	5.5	0 15	1.7	12 00	1.3
24	7 00	4.6	7 35	5.6	0 50	1.6	1 00	1.2
25	8 00	4.8	8 25	5.4	2 00	1.5	2 00	1.3
26	8 50	4.7	9 20	5.2	2 50	1.3	2 50	1.2
27	10 00	4.7	10 25	5.0	3 40	1.3	3 50	1.4
28	10 50	4.8	11 15	4.8	4 30	1.4	4 50	1.7
29	11 45	4.7	.. ..	. .	5 20	1.6	5 45	1.8
30	0 00	4.5	12 40	4.6	6 30	1.6	7 00	1.9
31	1 00	4.2	1 40	4.5	7 10	1.6	7 50	2.1
Aug. 1	2 00	4.0	2 30	4.6	8 10	1.8	9 00	2.2
2	3 00	3.9	3 35	4.5	9 15	1.8	10 00	2.1
3	3 50	3.8	4 30	4.6	10 00	1.8	11 00	2.1
4	4 55	3.9	5 15	4.7	10 50	1.9	11 50	2.1
5	5 20	4.0	6 20	4.8	11 25	1.9	.. ..	. .
6	7 20	4.0	7 50	4.7	1 15	2.1	1 00	1.8
7	8 00	3.9	8 00	4.6	2 10	2.0	1 50	1.7
8	8 00	4.1	8 00	4.7	2 00	2.0	2 00	1.9
9	8 10	4.2	8 30	4.7	2 20	2.0	2 15	1.9
10	8 50	4.2	8 55	4.5	3 00	2.0	2 50	1.8
11	9 10	4.2	9 35	4.6	3 00	1.9	3 15	2.0
12	9 55	4.6	10 00	4.6	4 00	2.1	3 50	2.3
13	10 20	4.7	10 30	4.4	4 00	2.1	4 35	2.4
14	11 00	4.5	11 00	4.1	4 40	1.9	5 25	2.1
15	.. ..	. .	12 30	4.7	5 25	1.9	6 50	2.3
16	0 35	4.3	1 15	4.8	6 50	2.0	7 30	2.4
17	1 30	4.3	2 15	5.0	7 40	2.1	8 50	2.4
18	2 35	4.4	3 15	5.1	8 35	1.9	9 45	2.3
19	3 30	4.4	4 10	5.3	9 35	1.7	10 40	2.1
20	4 30	4.6	5 10	5.5	10 35	1.7	11 50	1.9
21	5 30	4.7	6 00	5.4	11 35	1.4	.. ..	. .
22	6 20	4.8	7 00	5.4	0 30	1.5	12 30	1.2
23	7 20	4.8	7 50	5.2	1 20	1.3	1 25	1.1
24	8 15	4.9	8 40	5.1	2 00	1.1	2 30	1.2
25	9 10	5.0	9 25	4.8	3 00	1.3	3 20	1.4
26	10 10	4.9	10 20	4.5	3 50	1.4	4 25	1.6
27	10 55	4.8	11 00	4.4	4 30	1.5	5 10	1.9
28	11 50	4.8	.. ..	. .	5 30	1.7	6 10	2.1
29	0 10	4.3	1 00	4.8	6 10	1.9	7 15	2.3
30	1 10	4.1	2 00	4.6	7 15	2.0	8 25	2.3
31	2 15	4.0	2 45	4.6	8 15	2.1	9 30	2.4

* The values in parentheses are interpolated.

HIGH AND LOW WATERS.—Continued.

Date.	High Waters.				Low Waters.			
	A. M.		P. M.		A. M.		P. M.	
1903.	Time.	Height.	Time.	Height.	Time.	Height.	Time.	Height.
	h. m.	Feet.	h. m.	Feet.	h. m.	Feet.	h. m.	Feet.
Sept. 1	3 00	4.1	3 45	4.7	9 10	2.2	10 10	2.4
2	4 00	4.1	4 50	4.5	10 30	2.0	11 10	2.1
3	5 10	4.0	5 25	4.8	10 45	2.0	11 35	2.4
4	5 55	4.3	6 20	4.9	.. ..	. .	12 00	2.1
5	6 50	4.5	7 00	5.1	0 20	2.2	12 50	2.2
6	7 15	4.7	7 20	5.2	1 10	2.4	1 15	2.4
7	7 50	5.0	7 50	5.2	1 40	2.5	1 50	2.4
8	8 25	5.1	8 30	5.1	2 00	2.4	2 25	2.4
9	9 00	4.7	9 10	4.7	2 28	2.4	3 15	2.0
10	9 50	5.1	10 00	5.3	3 20	2.1	4 10	3.0
11	(10 40)	(5.1)	(10 50)	(4.6)	(4 05)	(2.1)	(5 05)	(2.4)
12	(11 30)	(4.8)	(11 45)	(4.3)	(5 00)	(2.1)	(6 00)	(2.2)
13	.. ..	. .	(12 20)	(4.7)	(5 50)	(1.9)	(6 50)	(2.2)
14	(0 35)	(4.1)	(1 10)	(4.7)	(6 40)	(1.8)	(7 45)	(2.0)
15	(1 30)	(4.2)	2 00	4.7	7 30	1.6	8 40	1.9
16	2 25	4.0	(2 55)	(4.9)	8 30	1.7	9 20	1.9
17	3 10	4.3	3 50	5.0	9 10	1.7	10 25	1.8
18	4 20	4.7	5 00	5.3	10 40	1.6	11 25	1.8
19	5 30	5.0	6 10	5.3	11 50	1.5	.. ..	. .
20	(6 25)	(5.0)	(7 00)	(5.2)	(0 15)	(1.6)	(12 40)	(1.4)
21	(7 15)	(5.1)	7 50	5.1	(1 10)	(1.5)	(1 30)	(1.4)
22	8 10	5.3	8 30	5.1	2 00	1.6	2 25	1.7
23	9 00	5.5	9 00	5.0	2 30	1.8	3 00	2.0
24	9 40	5.3	10 00	4.5	3 00	1.8	4 00	1.9
25	10 40	4.9	11 00	4.2	4 10	1.8	5 10	2.0
26	11 30	4.7	11 45	4.0	5 15	1.9	6 10	2.1
27	.. ..	. .	12 25	4.6	6 00	2.0	7 00	2.2
28	0 45	4.0	1 25	4.4	6 40	2.1	8 00	2.2
29	1 50	3.9	2 20	4.4	7 40	2.3	8 45	2.4
30	2 35	3.9	3 15	4.4	8 50	2.2	9 50	2.3
Oct. 1	3 25	3.9	4 15	4.4	9 50	2.2	10 25	2.3
2	4 25	4.1	5 00	4.5	10 50	2.1	11 20	2.2
3	5 15	4.3	(5 40)	(4.8)	(11 30)	(2.2)	11 50	2.4
4	5 40	4.8	6 15	4.8	.. ..	. .	12 10	2.3
5	6 25	4.8	7 00	4.7	0 20	2.1	1 00	2.1
6	7 10	5.0	7 20	4.8	1 00	2.2	1 35	2.3
7	7 50	5.1	7 50	4.7	1 30	2.1	2 00	2.1
8	8 30	5.1	8 50	4.7	2 10	2.0	2 40	2.0
9	9 15	5.4	9 30	4.7	2 35	2.1	3 35	2.3
10	10 10	5.4	10 00	4.7	3 35	2.2	4 35	2.4
11	10 45	5.3	10 45	4.4	4 20	2.2	5 15	2.2
12	11 25	4.8	.. ..	. .	(5 15)	(1.9)	6 15	2.0
13	0 00	4.0	12 40	4.5	6 15	1.6	7 15	1.7
14	1 10	4.0	1 50	4.8	7 10	1.9	8 25	2.2
15	2 15	4.5	2 50	4.9	8 25	2.0	9 00	2.0
16	3 00	4.6	3 50	4.9	9 20	1.9	10 10	1.9
17	(4 00)	(5.0)	4 50	5.0	10 40	1.8	(10 50)	(1.7)
18	(4 55)	(5.1)	5 40	4.9	11 20	1.6	11 35	1.6
19	(5 50)	(5.2)	6 40	4.9	.. ..	. .	12 25	1.6
20	(6 45)	(5.3)	7 20	4.9	0 25	1.6	1 25	1.7
21	(7 45)	(5.4)	8 00	4.7	(1 15)	(1.6)	2 00	1.7
22	8 40	5.3	8 50	4.5	2 00	1.6	3 00	1.8
23	9 20	5.2	9 40	4.3	2 50	1.8	3 50	2.0
24	10 20	5.0	10 30	4.0	3 40	1.9	4 40	2.0
25	11 00	4.5	11 15	3.7	4 25	1.9	5 25	1.9
26	11 40	4.3	.. ..	. .	5 25	1.9	6 10	2.0
27	0 00	3.6	12 25	4.1	6 00	2.0	7 00	2.0
28	1 00	3.7	1 20	4.1	7 00	2.2	7 50	2.2
29	1 50	3.8	2 30	4.1	8 25	2.3	8 50	2.1
30	3 00	3.8	3 10	4.1	9 00	2.1	9 45	2.0
31	3 40	3.9	4 00	4.0	10 00	2.1	10 25	1.8

HIGH AND LOW WATERS.—Continued.

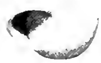
Date.	High Waters.				Low Waters.			
	A. M.		P. M.		A. M.		P. M.	
1903.	Time.	Height.	Time.	Height.	Time.	Height.	Time.	Height.
	h. m.	Feet.	h. m.	Feet.	h. m.	Feet.	h. m.	Feet.
Nov. 1	4 35	3.9	4 50	4.0	10 50	1.8	10 50	1.7
2	5 15	4.3	5 25	4.1	11 35	1.8	11 35	1.5
3	5 50	4.4	6 00	4.0	.. ..	. .	12 25	1.6
4	6 30	4.8	7 00	4.4	0 00	1.5	1 00	1.8
5	7 10	4.3	7 25	4.3	0 45	1.6	1 35	1.7
6	(8 00)	(5.0)	8 10	4.3	(1 30)	(1.5)	2 25	1.7
7	8 45	5.0	9 00	4.0	2 10	1.4	3 15	1.5
8	9 30	4.9	10 00	3.9	3 10	1.3	4 15	1.5
9	10 25	4.9	11 00	4.0	4 00	1.5	5 00	1.5
10	11 20	4.8	.. ..	. .	5 00	1.6	6 00	1.7
11	0 00	4.0	12 15	4.6	5 45	1.6	7 00	1.6
12	1 00	4.1	1 20	4.4	7 00	1.7	8 00	1.5
13	2 15	4.1	2 30	4.3	8 15	1.7	9 00	1.5
14	3 20	4.3	3 25	4.3	9 30	1.7	10 00	1.4
15	4 15	4.6	4 25	4.3	10 30	1.7	10 50	1.4
16	5 10	4.8	5 25	4.3	11 30	1.6	11 40	1.5
17	6 00	5.0	6 10	4.4	.. ..	. .	12 20	1.7
18	7 00	5.0	7 00	4.1	0 30	1.5	1 10	1.6
19	7 30	5.0	7 45	4.1	1 15	1.4	1 50	1.6
20	8 25	5.0	8 45	3.9	1 50	1.6	2 40	1.7
21	9 00	4.7	9 00	3.9	2 25	1.5	3 15	1.7
22	9 45	4.8	10 00	3.9	3 15	1.7	4 15	1.9
23	10 25	4.6	10 50	3.8	3 50	1.9	4 40	2.0
24	11 00	4.4	11 30	3.6	4 45	2.0	5 40	2.0
25	11 40	4.2	.. ..	. .	5 20	2.0	6 20	2.0
26	0 25	3.8	12 30	4.3	6 15	2.2	7 00	2.1
27	1 20	3.9	1 30	4.0	7 30	2.3	8 00	2.0
28	2 10	3.8	2 30	3.9	8 20	2.1	8 40	1.9
29	3 00	4.2	3 00	4.0	9 45	2.2	9 25	1.8
30	3 40	4.0	4 00	4.0	10 00	2.0	10 15	1.7
Dec. 1	4 35	4.5	5 00	3.9	11 00	1.9	11 00	1.5
2	5 20	4.6	5 35	4.0	.. ..	. .	12 00	1.7
3	6 20	4.8	6 25	3.9	0 00	1.4	1 00	1.4
4	7 00	5.0	7 00	4.0	0 35	1.2	1 30	1.5
5	7 50	5.0	8 00	4.0	1 20	1.1	2 25	1.1
6	8 25	5.0	8 50	4.0	2 10	0.9	3 00	1.1
7	9 20	5.1	(9 40)	(4.1)	3 00	1.0	(3 55)	(1.2)
8	10 10	5.0	10 35	4.2	(3 50)	(1.2)	4 50	1.3
9	11 00	4.9	(11 40)	(4.2)	4 40	1.5	6 00	1.5
10	11 50	4.6	.. ..	. .	(5 35)	(1.5)	7 00	1.3
11	0 50	4.2	1 00	4.2	6 30	1.6	7 50	1.3
12	2 00	4.2	2 00	4.0	8 00	1.7	9 00	1.3
13	3 00	4.4	3 10	3.9	9 15	1.6	9 45	1.2
14	(3 55)	(4.5)	(4 10)	(3.9)	(10 15)	(1.6)	10 35	1.2
15	4 50	4.5	5 10	3.9	11 15	1.6	(11 15)	(1.2)
16	(5 40)	(4.6)	5 50	3.9	.. ..	. .	(12 10)	(1.6)
17	6 30	4.7	6 45	3.9	0 00	1.3	1 00	1.5
18	7 10	4.7	7 10	3.8	0 50	1.3	2 00	1.4
19	8 10	4.6	8 00	3.5	1 35	1.2	2 30	1.3
20	8 30	4.5	8 50	3.6	2 10	1.3	3 00	1.4
21	9 15	4.3	9 35	3.5	2 45	1.2	3 40	1.4
22	10 00	4.3	10 15	3.6	3 30	1.4	4 20	1.5
23	10 30	4.2	(10 55)	(3.5)	4 00	1.7	5 10	1.6
24	(11 10)	(4.1)	(11 35)	(3.6)	(4 45)	(1.9)	(5 45)	(1.8)
25	(11 55)	(4.0)	.. ..	. .	(5 30)	(2.0)	(6 25)	(1.9)
26	(0 20)	(3.7)	(12 35)	(3.8)	(6 15)	(2.0)	7 00	1.7
27	1 00	3.6	1 20	3.6	7 00	1.9	7 45	1.5
28	2 15	3.8	(2 20)	(3.6)	(8 15)	(1.8)	8 45	1.5
29	3 10	3.9	3 15	3.5	9 30	1.8	9 40	1.3
30	4 00	4.1	4 10	3.6	10 30	1.7	10 40	1.1
31	5 00	4.3	5 18	3.5	11 35	1.5	11 30	1.0

HIGH AND LOW WATERS.—Continued.

Date.		High Waters.				Low Waters.			
		A. M.		P. M.		A. M.		P. M.	
1904.		Time.	Height.	Time.	Height.	Time.	Height.	Time.	Height.
		h. m.	Feet.	h. m.	Feet.	h. m.	Feet.	h. m.	Feet.
Jan.	1	5 45	4.5	5 50	3.8	.. ..	. .	12 25	1.4
	2	6 40	4.9	6 45	3.9	0 15	1.0	1 15	1.3
	3	7 25	5.0	7 35	4.2	1 00	0.9	2 10	1.2
	4	8 15	5.2	8 30	4.0	2 00	0.9	3 00	1.1
	5	9 20	5.0	9 30	4.0	2 40	0.9	3 45	1.0
	6	9 50	4.8	10 30	4.1	3 40	1.0	4 30	0.9
	7	10 50	4.6	11 35	4.4	4 30	1.1	5 15	1.2
	8	11 45	4.5	.. ..	. .	5 35	1.6	6 20	1.3
	9	0 30	4.3	12 40	4.2	6 30	1.6	7 10	1.3
	10	1 20	4.2	1 40	3.7	7 45	1.6	8 00	1.1
	11	2 30	4.2	2 45	3.7	8 50	1.6	9 00	1.2
	12	3 30	4.3	3 50	3.6	10 00	1.6	9 55	1.2
	13	4 20	4.3	4 50	3.7	11 10	1.5	10 40	1.3
	14	5 10	4.3	5 15	3.4	12 00	1.5	11 45	1.1
	15	6 00	4.2	6 15	3.3	.. ..	. .	12 25	1.2
	16	6 50	4.3	7 00	3.5	0 20	1.1	1 20	1.4
	17	7 30	4.3	7 45	3.6	0 50	1.1	1 35	1.3
	18	8 10	4.4	8 10	3.5	1 30	1.3	2 25	1.3
	19	8 50	4.3	9 00	3.4	2 15	1.3	3 15	1.4
	20	9 30	3.9	9 35	3.4	3 10	1.2	3 50	1.3
	21	9 55	4.2	10 20	3.8	3 40	1.4	4 15	1.6
	22	10 30	4.1	10 50	3.7	4 30	1.8	4 45	1.6
	23	11 00	3.9	11 35	3.8	4 50	1.8	5 10	1.5
	24	11 35	3.6	.. ..	. .	6 00	1.7	6 00	1.4
	25	0 30	3.8	12 25	3.6	6 50	1.8	7 00	1.4
	26	1 30	3.8	1 25	3.4	7 45	1.7	7 50	1.4
	27	2 15	4.0	2 15	3.5	8 40	1.9	8 35	1.4
	28	3 15	4.2	(3 20)	(3.6)	(9 40)	(1.7)	9 35	1.3
	29	4 15	4.4	4 30	3.7	10 45	1.6	10 25	1.0
	30	5 10	4.6	5 10	3.8	11 30	1.4	11 30	0.8
	31	6 00	5.0	6 20	4.3	.. ..	. .	12 35	1.4
Feb.	1	7 00	5.2	7 20	4.1	0 25	0.9	1 40	0.9
	2	7 50	4.9	(8 15)	(4.3)	1 20	0.5	(2 25)	(0.7)
	3	8 50	4.8	9 10	4.4	(2 20)	(0.6)	3 15	0.8
	4	9 35	4.5	10 10	4.1	3 20	0.7	3 50	0.6
	5	10 20	4.2	11 00	4.1	4 15	0.8	4 40	0.7
	6	11 10	3.9	.. ..	. .	5 10	1.0	5 35	0.8
	7	0 00	4.0	12 00	3.7	6 10	1.3	6 30	1.0
	8	1 00	4.0	1 15	3.4	7 20	1.4	7 25	1.1
	9	2 00	3.9	2 25	3.3	8 25	1.5	8 25	1.3
	10	3 00	4.1	3 25	3.5	9 20	1.7	9 20	1.4
	11	(4 00)	(4.2)	4 20	3.4	10 30	1.7	10 15	1.5
	12	5 00	4.2	5 15	3.6	11 35	1.8	11 20	1.5
	13	5 50	4.3	6 00	3.5	.. ..	. .	12 10	1.6
	14	6 30	4.1	(6 40)	(3.7)	0 00	1.1	12 35	1.3
	15	(7 05)	(4.2)	(7 20)	(3.9)	(0 40)	(1.2)	1 30	1.6
	16	(7 35)	(4.3)	8 00	4.0	(1 20)	(1.3)	(2 00)	(1.5)
	17	8 10	4.3	8 30	3.9	2 00	1.4	2 25	1.4
	18	8 50	4.0	9 10	3.7	2 30	1.3	3 00	1.3
	19	9 20	3.9	9 35	3.9	3 15	1.2	3 20	1.4
	20	9 50	4.0	10 10	4.0	3 40	1.6	4 00	1.5
	21	10 20	3.8	11 00	4.0	4 20	1.7	4 40	1.4
	22	11 15	3.6	11 45	3.8	5 25	1.7	5 25	1.4
	23	.. ..	. .	12 00	3.4	6 10	1.5	6 00	1.3
	24	0 50	3.8	12 50	3.5	6 50	1.7	7 00	1.5
	25	1 35	4.0	(2 00)	(3.3)	7 50	1.7	(8 00)	(1.3)
	26	(2 45)	(4.2)	3 00	3.6	9 10	1.7	9 00	1.4
	27	3 50	4.4	4 15	3.7	10 10	1.6	10 20	1.1
	28	4 50	4.5	(5 15)	(4.1)	(11 00)	(1.3)	(11 10)	(1.0)
	29	(5 40)	(4.7)	6 10	4.4	(11 55)	(1.0)	.. ..	. .

HIGH AND LOW WATERS.—Continued.

Date. 1904.	High Waters. A. M. Time.	High Waters. A. M. Height.	High Waters. P. M. Time.	High Waters. P. M. Height.	Low Waters. A. M. Time.	Low Waters. A. M. Height.	Low Waters. P. M. Time.	Low Waters. P. M. Height.
	h. m.	Feet.	h. m.	Feet.	h. m.	Feet.	h. m.	Feet.
Mar. 1	6 30	4.9	7 15	4.5	0 00	0.9	12 45	0.8
2	7 25	4.8	7 50	4.7	1 15	0.7	1 45	0.8
3	8 15	4.9	8 50	4.9	2 00	0.8	2 35	0.9
4	9 20	4.7	9 45	4.7	3 00	1.1	3 25	1.0
5	10 00	4.4	10 30	4.8	3 50	1.1	4 00	1.1
6	10 45	4.1	11 25	4.6	(5 00)	(1.4)	5 00	1.3
7	11 35	4.0	.. ..	..	(5 55)	(1.6)	5 50	1.4
8	0 15	4.5	12 40	3.9	6 45	1.8	6 50	1.7
9	1 30	4.4	2 00	3.8	7 50	1.9	7 50	1.7
10	2 20	4.1	2 40	3.4	8 45	1.9	8 40	1.6
11	3 20	4.1	4 00	3.6	10 00	1.8	9 45	1.8
12	4 25	4.2	4 50	3.8	10 40	2.0	10 30	1.8
13	5 20	4.3	5 35	3.9	11 30	1.8	11 25	1.8
14	5 50	4.3	6 00	4.0	.. ..	..	12 10	1.8
15	6 25	4.1	7 00	3.9	0 10	1.6	12 35	1.4
16	7 30	4.2	7 25	4.1	1 00	1.4	1 35	1.6
17	7 45	4.0	7 50	4.0	1 40	1.3	1 35	1.3
18	8 00	4.0	8 40	4.4	(2 25)	(1.4)	2 10	1.4
19	9 10	4.1	9 10	4.5	3 10	1.6	3 00	1.5
20	9 20	4.0	9 45	4.4	3 30	1.7	3 25	1.4
21	10 00	4.0	10 25	4.3	4 00	1.7	4 00	1.4
22	10 40	3.7	11 15	4.3	5 00	1.6	4 35	1.4
23	11 25	3.6	.. ..	..	6 00	1.7	5 25	1.4
24	0 20	4.3	12 20	3.5	6 35	1.7	6 30	1.5
25	1 10	4.4	1 30	3.6	7 50	1.7	7 30	1.6
26	2 10	4.4	2 50	3.8	8 50	1.8	8 40	1.6
27	3 25	4.5	4 00	4.0	9 50	1.7	9 50	1.6
28	4 25	4.9	4 50	4.5	10 40	1.7	10 45	1.5
29	5 20	4.9	5 50	5.0	11 30	1.4	.. ..	..
30	6 10	5.0	6 35	4.9	0 00	1.3	12 30	1.1
31	7 10	4.7	7 35	4.9	0 50	1.0	1 15	0.7
Apr. 1	7 50	4.5	8 25	5.0	1 50	0.9	2 00	0.8
2	8 40	4.3	9 10	4.9	2 50	1.1	2 45	0.8
3	9 30	4.1	10 10	4.7	3 40	1.1	3 40	1.0
4	10 15	3.9	10 50	4.4	4 25	1.3	4 15	1.3
5	11 20	3.7	11 40	4.2	5 25	1.5	5 25	1.4
6	.. ..	..	12 00	3.5	6 25	1.6	6 10	1.6
7	0 35	4.2	1 00	3.7	7 10	1.9	7 10	1.9
8	1 30	4.2	2 15	3.6	8 10	1.9	8 10	1.9
9	2 40	4.1	3 10	3.7	9 00	2.0	9 00	2.0
10	3 25	4.1	4 10	3.6	9 50	1.9	10 10	1.8
11	4 20	3.9	4 45	3.8	10 35	1.7	10 45	1.7
12	5 10	4.0	5 40	4.0	11 10	1.7	11 40	1.8
13	5 50	4.1	6 20	4.4	.. ..	..	12 00	1.7
14	6 30	4.2	6 50	4.5	0 25	1.9	12 30	1.7
15	7 00	4.1	7 30	4.5	1 00	1.7	1 10	1.4
16	7 40	4.0	8 15	4.7	1 40	1.6	1 35	1.5
17	8 20	4.1	8 45	4.8	2 25	1.7	2 20	1.4
18	9 00	4.3	9 30	4.9	3 15	1.7	3 00	1.6
19	9 45	4.1	10 10	4.8	3 50	1.8	3 30	1.5
20	(10 35)	(3.8)	(11 05)	(4.6)	4 40	1.8	(4 20)	(1.5)
21	11 30	4.0	.. ..	..	(5 40)	(1.7)	5 15	1.7
22	0 00	4.7	12 30	3.8	6 35	1.8	6 20	1.7
23	1 10	4.6	1 25	3.8	7 30	1.7	7 40	1.6
24	2 00	4.4	(2 25)	(4.0)	8 25	1.5	(8 35)	(1.5)
25	(3 00)	(4.3)	(3 30)	(4.4)	(9 15)	(1.4)	(9 25)	(1.5)
26	(4 00)	(4.3)	4 35	4.6	(10 10)	(1.3)	10 20	1.4
27	(5 00)	(4.4)	(5 35)	(4.9)	11 00	1.2	11 50	1.4
28	6 00	4.5	6 35	5.1	.. ..	..	12 00	1.1
29	6 50	4.5	7 15	5.2	0 35	1.4	12 40	1.1
30	7 35	4.4	8 10	5.2	1 30	1.3	1 35	1.1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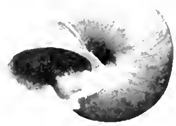
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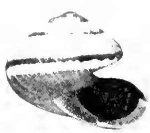
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9

BAHAMA FOSSILS

HIGH AND LOW WATERS.—Continued.

Date.	High Waters.				Low Waters.			
	A. M.		P. M.		A. M.		P. M.	
1904.	Time.	Height.	Time.	Height.	Time.	Height.	Time.	Height.
	h. m.	Feet.	h. m.	Feet.	h. m.	Feet.	h. m.	Feet.
May 1...........	8 25	4.2	8 50	5.2	2 00	1.3	2 25	1.2
2...........	9 00	4.2	(9 35)	(5.0)	3 10	1.5	(3 05)	(1.4)
3...........	10 00	4.1	10 20	4.8	(4 05)	(1.6)	3 50	1.6
4...........	10 50	3.8	(11 10)	(4.6)	5 00	1.7	5 00	1.7
5...........	11 35	3.6	.. ..	. .	(5 50)	(1.8)	5 40	1.9
6...........	0 00	4.3	12 40	3.6	6 35	1.9	6 30	2.0
7...........	0 50	4.3	1 45	3.9	7 30	2.0	7 45	2.2
8...........	1 35	4.2	2 30	3.8	8 25	1.9	8 50	2.1
9...........	2 40	4.1	3 30	4.0	8 50	2.0	9 25	2.1
10...........	3 40	4.0	4 20	4.1	9 40	1.9	10 25	2.1
11...........	4 30	4.0	5 00	4.1	10 25	1.8	11 10	1.9
12...........	5 10	3.9	5 40	4.4	11 00	1.6	11 50	1.9
13...........	5 55	4.0	6 25	4.5	11 50	1.5	.. ..	. .
14...........	6 25	3.9	7 00	4.8	0 30	1.6	12 20	1.4
15...........	7 15	4.0	7 45	5.0	1 20	1.7	12 50	1.5
16...........	8 00	4.1	8 20	5.0	2 00	1.7	1 40	1.4
17...........	8 35	4.0	9 00	5.1	2 40	1.6	2 20	1.4
18...........	9 25	4.0	10 00	5.0	3 30	1.6	3 00	1.4
19...........	10 20	4.0	10 40	4.9	4 25	1.6	4 10	1.5
20...........	11 00	4.0	11 50	4.8	5 20	1.6	5 30	1.6
21...........	12 00	4.2	.. ..	. .	6 00	1.6	6 20	1.9
22...........	0 30	4.8	1 30	4.3	7 00	1.8	7 20	1.9
23...........	2 00	4.6	2 30	4.4	8 20	1.5	8 40	1.7
24...........	2 40	4.4	3 45	4.6	9 00	1.4	9 45	1.7
25...........	4 00	4.3	4 30	4.7	10 00	1.3	11 00	1.7
26...........	5 00	4.2	5 30	5.0	11 00	1.3	11 50	1.7
27...........	5 35	4.3	6 00	5.0	11 40	1.4	.. ..	. .
28...........	6 30	4.2	7 00	5.1	0 35	1.5	12 30	1.3
29...........	7 20	4.2	7 50	5.1	1 30	1.6	1 20	1.3
30...........	8 00	4.1	8 25	5.1	2 25	1.6	2 00	1.5
31...........	9 00	4.1	9 00	5.0	3 00	1.7	2 35	1.6
June 1...........	9 40	4.0	10 00	4.8	3 50	1.7	3 30	1.7
2...........	10 40	3.9	11 00	4.5	4 40	1.8	4 35	1.8
3...........	11 25	3.9	11 20	4.4	5 35	1.9	5 10	1.9
4...........	.. ..	. .	12 00	3.9	6 20	1.9	6 00	2.1
5...........	0 20	4.3	12 35	3.8	6 50	1.9	7 00	2.2
6...........	1 15	4.1	2 00	4.0	7 25	1.9	8 00	2.2
7...........	2 00	4.1	2 30	4.1	8 30	2.0	9 00	2.2
8...........	2 35	3.9	3 20	4.2	9 00	1.8	9 30	2.2
9...........	3 15	3.9	4 15	4.5	9 35	1.9	10 30	2.2
10...........	4 15	4.0	5 00	4.7	10 30	1.8	11 20	2.1
11...........	5 00	4.1	5 25	5.1	11 15	1.8	11 55	2.1
12...........	5 35	4.2	6 15	5.2	11 40	1.8	.. ..	. .
13...........	6 25	4.3	7 20	5.3	0 25	2.0	12 30	1.7
14...........	7 35	4.4	8 10	5.4	1 30	1.9	2 00	1.6
15...........	8 40	4.4	9 00	5.2	2 30	1.8	2 25	1.5
16...........	10 00	4.3	10 15	5.2	3 30	1.6	4 00	1.5
17...........	10 20	4.3	10 40	5.0	5 00	1.5	4 35	1.5
18...........	11 00	4.3	11 30	4.8	5 00	1.5	5 00	1.5
19...........	.. ..	. .	12 10	4.3	6 00	1.4	6 20	1.6
20...........	0 20	4.5	1 20	4.4	7 00	1.4	7 15	1.9
21...........	1 25	4.5	2 15	4.7	8 00	1.6	8 20	2.0
22...........	2 30	4.5	3 15	5.0	8 35	1.6	9 30	2.1
23...........	3 20	4.4	4 15	5.0	9 40	1.7	10 25	2.0
24...........	4 30	4.2	5 15	5.0	10 30	1.5	11 30	1.9
25...........	5 25	4.2	6 00	5.0	11 20	1.5	.. ..	. .
26...........	6 10	4.1	6 50	5.1	0 15	1.9	12 10	1.5
27...........	7 10	4.1	7 30	5.1	1 00	1.9	12 50	1.6
28...........	7 45	4.2	8 15	5.1	2 00	2.0	1 35	1.8
29...........	8 25	4.2	9 00	5.0	2 40	2.0	2 20	1.9
30...........	9 10	4.2	9 30	4.9	3 20	2.0	3 10	2.0

Reduction of Records.

The tide follows the moon much more closely than it does the sun, so that there is a tendency for the tide to occur when the moon is in a given position in the heavens. The difference between the time of tide and the time of the moon's transit or meridian passage, is called the *lunitidal interval* for the station. Both upper and lower transits of the moon are usually compared with the time of the first high water and first low water which follows the given transit; hence we may express the operation as follows:

$$HWI = \text{Time of } HW - ☽\text{'s transit}$$
$$LWI = \text{Time of } LW - ☽\text{'s transit}$$

where

$$HWI = \text{high water lunitidal interval}$$
$$LWI = \text{low water lunitidal interval.}$$

The purpose of the tabulation given here, called "First Reduction," is to compute the lunitidal intervals for high and low waters, and also to find the mean range of tide and mean half-tide level. In this kind of work the time of the moon's transits should have been reduced to the meridian of Nassau, but in order to save work the unmodified Greenwich transits were used, and the final result corrected by the general formula:

$$x = 4\,[0.035\,(E - L) + S - L] \text{ minutes of time.}$$

where x = Correction to the lunitidal intervals, in minutes of time.

E = West longitude of the meridian for which the Ephemeris gives the moon's transits.

S = West longitude of the time meridian used for recording the observations, expressed in degrees and decimals.

L = West longitude of the station or local meridian expressed in degrees and decimals.

In this case $E = O$, as Greenwich transits are used.

$$S = L = 77°\ 21' = 77°.35.$$

Substituting these values in the equation it becomes:

$$x = -0.14\,L = -.14 \times 77.35 = -10.83 \text{ minutes.}$$

Hence the mean intervals for both high and low waters are diminished by 10.8 minutes. If, for any purpose, lunitidal intervals in any portion of the First Reduction are required, they should be corrected by the same constant. The mean lunitidal interval for high water at full and change of the moon is called the *Establishment of the Port*, and the mean of all the high water intervals is known as the corrected establishment of the port. For

Nassau the establishment is 7h. 28.7m., and the corrected establishment 7h. 22.8m., from this year of record. Further remarks upon lunitidal intervals follow the table of harmonic constants.

FIRST REDUCTION.

Lat. 25° 05′ N. Long. 77° 21′ W.

NOTE.—Automatic tide gauge No. 49, scale 1 : 9. W. C. Townsend, Observer. Observations made in mean local time. Unmodified Greenwich transits are used. Correction to lunitidal intervals is $x = -10.8$ m.

Date. Year 1903.	Moon's Transits.	Time of— High Water.	Time of— Low Water.	Lunitidal Interval. High Water.	Lunitidal Interval. Low Water.	Height of— High Water.	Height of— Low Water.
mo. d.	h. m.	h. m.	h. m.	h. m.	h. m.	feet.	feet.
July 1..........	(5 26)*	.. ..	(6 30)	. ..	(1 04)	. .	(1.0)
	17 51	13 00	(19 10)	(7 34)	1 19	3.8	(1.7)
2..........	(6 15)	1 00	(7 30)	7 09	(1 15)	3.5	(1.3)
	18 39	14 00	20 20	(7 45)	1 41	4.5	2.1
3..........	(7 03)	2 50	8 20	8 11	(1 17)	4.2	1.7
	19 27	(15 05)	(21 25)	(8 02)	1 58	(4.6)	(2.1)
4..........	(7 51)	(3 25)	9 40	7 58	(1 49)	(4.1)	1.6
	20 15	16 10	22 30	(8 19)	2 15	4.6	2.1
5..........	(8 39)	4 00	10 20	7 45	(1 41)	3.9	1.6
	21 03	16 40	23 15	(8 01)	2 12	4.7	2.0
6..........	(9 27)	5 00	11 10	7 57	(1 43)	3.8	1.6
	21 51	17 35	.. ..	(8 08)	. ..	4.7	. .
7..........	(10 15)	6 00	0 00	8 09	2 09	3.8	1.9
	22 40	18 20	11 50	(8 05)	(1 35)	4.8	1.7
8..........	(11 04)	6 20	0 35	7 40	1 55	3.9	2.0
	23 28	18 50	12 20	(7 46)	(1 16)	4.8	1.7
9..........	(11 51)	7 10	1 15	7 42	1 47	3.9	2.0
	.. ..	19 45	13 00	(7 54)	(1 09)	4.8	1.7
10..........	0 15	8 00	2 10	7 45	1 55	4.0	2.0
	(12 38)	(20 20)	14 00	(7 42)	(1 22)	(4.8)	1.9
11..........	1 01	8 20	(2 35)	7 19	1 34	4.0	(2.0)
	(13 24)	20 50	14 10	(7 26)	(0 46)	4.7	1.9
12..........	1 46	8 50	3 00	7 04	1 14	4.1	2.0
	(14 08)	21 15	14 50	(7 07)	(0 42)	4.7	2.0
13..........	2 30	9 40	3 50	7 10	1 20	4.2	2.0
	(14 52)	22 00	15 30	(7 08)	(0 38)	4.6	2.1
14..........	3 14	10 50	4 30	7 36	1 16	4.1	2.0
	(15 35)	22 45	16 30	(7 10)	(0 55)	4.5	2.1
15..........	3 57	11 40	5 10	7 43	1 13	4.3	2.0
	(16 19)	23 50	17 15	(7 31)	(0 56)	4.4	2.3
16..........	4 41	.. ..	5 50	. ..	1 09	. .	2.2
	(17 04)	12 15	18 15	7 34	(1 11)	4.5	2.4
Half monthly sums..........				30 217 800	31 29 916	30 129.3	31 58.7
17..........	5 26	0 20	6 50	(7 16)	1 24	4.3	2.0
	(17 50)	13 00	19 10	7 34	(1 20)	4.5	2.4
18..........	6 14	1 00	7 20	(7 10)	(1 06)	4.2	2.0
	(18 39)	14 00	20 10	7 46	(1 31)	4.5	2.3

* The values in parentheses in the columns of time and height are interpolated. A similar marking indicates the moon's lower transits and the lunitidal intervals obtained therefrom, which are not interpolated.

FIRST REDUCTION.—Continued.

Date. Year 1903.	Moon's Transits.	Time of— High Water.	Time of— Low Water.	Lunitidal Interval. High Water.	Lunitidal Interval. Low Water.	Height of— High Water.	Height of— Low Water.
mo. d.	h. m.	h. m.	h. m.	h. m.	h. m.	feet.	feet.
July 19..........	7 05	2 00	8 15	(7 21)	1 10	4.1	1.9
	(19 31)	15 00	21 10	7 55	(1 39)	4.8	2.3
20..........	7 59	3 00	9 10	(7 29)	1 11	4.2	1.8
	(20 27)	15 55	22 15	7 56	(1 48)	5.0	2.2
21..........	8 56	4 00	10 15	(7 33)	1 19	4.2	1.6
	(21 26)	16 50	23 15	7 54	(1 49)	5.2	1.9
22..........	9 57	5 00	11 00	(7 34)	1 03	4.3	1.4
	(22 28)	17 40	.. ..	7 43	. ..	5.4	. .
23..........	10 59	6 00	0 15	(7 32)	(1 47)	4.5	1.7
	(23 30)	18 30	12 00	7 31	1 01	5.5	1.3
24..........	.. ..	7 00	0 50	(7 30)	(1 20)	4.6	1.6
	12 00	19 35	13 00	7 35	1 00	5.6	1.2
25..........	(0 30)	8 00	2 00	(7 30)	(1 30)	4.8	1.5
	13 00	20 25	14 00	7 25	1 00	5.4	1.3
26..........	(1 29)	8 50	2 50	(7 21)	(1 21)	4.7	1.3
	13 57	21 20	14 50	7 23	0 53	5.2	1.2
27..........	(2 25)	10 00	3 40	(7 35)	(1 15)	4.7	1.3
	14 52	22 25	15 50	7 33	0 58	5.0	1.4
28..........	(3 18)	10 50	4 30	(7 32)	(1 12)	4.8	1.4
	15 44	23 15	16 50	7 31	1 06	4.8	1.7
29..........	(4 09)	11 45	5 20	(7 36)	(1 11)	4.7	1.6
	16 34	.. ..	17 45	. ..	1 11	. .	1.8
30..........	(4 59)	0 00	6 30	7 26	(1 31)	4.5	1.6
	17 23	12 40	19 00	(7 41)	1 37	4.6	1.9
31..........	(5 48)	1 00	7 10	7 37	(1 22)	4.2	1.6
	18 12	13 40	19 50	(7 52)	1 38	4.5	2.1
Half monthly sums..........................				29 203 981	29 27 673	29 136.8	29 49.3
Aug. 1..........	(6 36)	2 00	8 10	7 48	(1 34)	4.0	1.8
	19 00	14 30	21 00	(7 54)	2 00	4.6	2.2
2..........	(7 24)	3 00	9 15	8 00	(1 51)	3.9	1.8
	19 49	15 35	22 00	(8 11)	2 11	4.5	2.1
3..........	(8 13)	3 50	10 00	8 01	(1 47)	3.8	1.8
	20 37	16 30	23 00	(8 17)	2 23	4.6	2.1
4..........	(9 01)	4 55	10 50	8 18	(1 49)	3.9	1.9
	21 25	17 15	23 50	(8 14)	2 25	4.7	2.1
5..........	(9 48)	5 20	11 25	7 55	(1 37)	4.0	1.9
	22 12	18 20	.. ..	(8 32)	. ..	4.8	. .
6..........	(10 35)	7 20	1 15	9 08	3 03	4.0	2.1
	22 59	19 50	13 00	(9 15)	(2 25)	4.7	1.8
7..........	(11 22)	8 00	2 10	9 01	3 11	3.9	2.0
	23 44	20 00	13 50	(8 38)	(2 28)	4.6	1.7
8..........	.. ..	8 00	2 00	8 16	2 16	4.1	2.0
	(12 06)	20 00	14 00	(7 54)	(1 54)	4.7	1.9
9..........	0 29	8 10	2 20	7 41	1 51	4.2	2.0
	(12 51)	20 30	14 15	(7 39)	(1 24)	4.7	1.9
10..........	1 13	8 50	3 00	7 37	1 47	4.2	2.0
	(13 34)	20 55	14 50	(7 21)	(1 16)	4.5	1.8
11..........	1 56	9 10	3 00	7 14	1 04	4.2	1.9
	(14 18)	21 35	15 15	(7 17)	(0 57)	4.6	2.0

FIRST REDUCTION.—Continued.

Date. Year 1903.	Moon's Transits.	Time of— High Water.	Time of— Low Water.	Lunitidal Interval. High Water.	Lunitidal Interval. Low Water.	Height of— High Water.	Height of— Low Water.
mo. d.	h. m.	h. m.	h. m.	h. m.	h. m.	feet.	feet.
Aug. 12..........	2 40	9 55	4 00	7 15	1 20	4.6	2.1
	(15 02)	22 00	15 50	(6 58)	(0 48)	4.6	2.3
13..........	3 25	10 20	4 00	6 55	0 35	4.7	2.1
	(15 47)	22 30	16 35	(6 43)	(0 48)	4.4	2.4
14..........	4 11	11 00	4 40	6 49	0 29	4.5	1.9
	(16 34)	23 00	17 25	(6 26)	(0 51)	4.1	2.1
15..........	4 59	.. ..	5 25	. ..	0 26	. .	1.9
	(17 24)	12 30	18 50	7 31	(1 26)	4.7	2.3
16..........	5 50	0 35	6 50	(7 11)	1 00	4.3	2.0
	(18 17)	13 15	19 30	7 25	(1 13)	4.8	2.4
Half monthly sums..........................				226 864	31 35 909	31 135.9	31 62.3
17..........	6 44	1 30	7 40	(7 13)	0 56	4.3	2.1
	(19 12)	14 15	20 50	7 31	(1 38)	5.0	2.4
18..........	7 41	2 35	8 35	(7 23)	0 54	4.4	1.9
	(20 11)	15 15	21 45	7 34	(1 34)	5.1	2.3
19..........	8 41	3 30	9 35	(7 19)	0 54	4.4	1.7
	(21 11)	16 10	22 40	7 29	(1 29)	5.3	2.1
20..........	9 41	4 30	10 35	(7 19)	0 54	4.6	1.7
	(22 11)	17 10	23 50	7 29	(1 39)	5.5	1.9
21..........	10 41	5 30	11 35	(7 19)	0 54	4.7	1.4
	(23 11)	18 00	.. ..	7 19	. ..	5.4	. .
22..........	11 40	6 20	0 30	(7 09)	(1 19)	4.8	1.5
	.. ..	19 00	12 30	7 20	0 50	5.4	1.2
23..........	(0 08)	7 20	1 20	(7 12)	(1 12)	4.8	1.3
	12 36	19 50	13 25	7 14	0 49	5.2	1.1
24..........	(1 04)	8 15	2 00	(7 11)	(0 56)	4.9	1.1
	13 30	20 40	14 30	7 10	1 00	5.1	1.2
25..........	(1 57)	9 10	3 00	(7 13)	(1 03)	5.0	1.3
	14 23	21 25	15 20	7 02	0 57	4.8	1.4
26..........	(2 49)	10 10	3 50	(7 21)	(1 01)	4.9	1.4
	15 14	22 20	16 25	7 06	1 11	4.5	1.6
27..........	(3 40)	10 55	4 30	(7 15)	(0 50)	4.8	1.5
	16 05	23 00	17 10	6 55	1 05	4.4	1.9
28..........	(4 30)	11 50	5 30	(7 20)	(1 00)	4.8	1.7
	16 54	.. ..	18 10	. ..	1 16	. .	2.1
29..........	(5 19)	0 10	6 10	7 16	(0 51)	4.3	1.9
	17 44	13 00	19 15	(7 41)	1 31	4.8	2.3
30..........	(6 08)	1 10	7 15	7 26	(1 07)	4.1	2.0
	18 33	14 00	20 25	(7 52)	1 52	4.6	2.3
31..........	(6 57)	2 15	8 15	7 42	(1 18)	4.0	2.1
	19 21	14 45	21 30	(7 48)	2 09	4.6	2.4
Half monthly sums..........................				29 202 668	29 19 909	29 138.5	29 50.8
Sept. 1..........	(7 45)	3 00	9 10	7 39	(1 25)	4.1	2 2
	20 08	15 45	22 10	(8 00)	2 02	4.7	2.4
2..........	(8 32)	4 00	10 30	7 52	(1 58)	4.1	2.0
	20 55	16 50	23 10	(8 18)	2 15	4.5	2.1
3..........	(9 18)	5 10	10 45	8 15	(1 27)	4.0	2.0
	21 41	17 25	23 35	(8 07)	1 54	4.8	2.4

FIRST REDUCTION.—Continued.

Date. Year 1903.	Moon's Transits.	Time of— High Water.	Time of— Low Water.	Lunitidal Interval. High Water.	Lunitidal Interval. Low Water.	Height of— High Water.	Height of— Low Water.
mo. d.	h. m.	h. m.	h. m.	h. m.	h. m.	feet.	feet.
Sept. 4..........	(10 04)	5 55	.. ..	8 14	. ..	4.3	. .
	22 26	18 20	12 00	(8 16)	(1 56)	4.9	2.1
5..........	(10 48)	6 50	0 20	8 24	1 54	4.5	2.2
	23 10	19 00	12 50	(8 12)	(2 02)	5.1	2.2
6..........	(11 32)	7 15	1 10	8 05	2 00	4.7	2.4
	23 54	19 20	13 15	(7 48)	(1 43)	5.2	2.4
7..........	.. ..	7 50	1 40	7 56	1 46	5.0	2.5
	(12 16)	19 50	13 50	(7 34)	(1 34)	5.2	2.4
8..........	0 39	8 25	2 00	7 46	1 21	5.1	2.4
	(13 01)	20 30	14 25	(7 29)	(1 24)	5.1	2.4
9..........	1 23	9 00	2 28	7 37	1 05	4.7	2.4
	(13 46)	21 10	15 15	(7 24)	(1 29)	4.7	2.0
10..........	2 09	9 50	3 20	7 41	1 11	5.1	2.1
	(14 33)	22 00	16 10	(7 27)	(1 37)	5.3	3.0
11..........	2 57	(10 40)	(4 05)	7 43	1 08	(5.1)	(2.1)
	(15 22)	(22 50)	(17 05)	(7 28)	(1 43)	(4.6)	(2.4)
12..........	3 47	(11 30)	(5 00)	7 43	1 13	(4.8)	(2.1)
	(16 12)	(23 45)	(18 00)	(7 33)	(1 48)	(4.3)	(2.2)
13..........	4 39	.. ..	(5 50)	. ..	1 11	. .	(1.9)
	(17 06)	(12 20)	(18 50)	7 41	(1 44)	(4.7)	(2.2)
14..........	5 34	(0 35)	(6 40)	(7 29)	1 06	(4.1)	(1.8)
	(18 02)	(13 10)	(19 45)	7 36	(1 43)	(4.7)	(2.0)
15..........	6 30	(1 30)	7 30	(7 28)	1 00	(4.2)	1.6
	(18 59)	14 00	20 40	7 30	(1 41)	4.7	1.9
16..........	7 28	2 25	8 30	(7 26)	1 02	4.0	1.7
	(19 57)	(14 55)	21 20	7 27	(1 23)	(4.9)	1.9
Half monthly sums..........................				31 226 908	31 35 825	31 145.2	31 67.4
17..........	8 26	3 10	9 10	(7 13)	0 44	4.3	1.7
	(20 55)	15 50	22 25	7 24	(1 30)	5.0	1.8
18..........	9 24	4 20	10 40	(7 25)	1 16	4.7	1.6
	(21 52)	17 00	23 25	7 36	(1 33)	5.3	1.8
19..........	10 20	5 30	11 50	(7 38)	1 30	5.0	1.5
	(22 48)	18 10	.. ..	7 50	. ..	5.3	. .
20..........	11 15	(6 25)	(0 15)	(7 37)	(1 27)	(5.0)	(1.6)
	(23 42)	(19 00)	(12 40)	7 45	1 25	(5.2)	(1.4)
21..........	.. ..	(7 15)	(1 10)	(7 33)	(1 28)	(5.1)	(1.5)
	12 08	19 50	(13 30)	7 42	1 22	5.1	(1.4)
22..........	(0 35)	8 10	2 00	(7 35)	(1 25)	5.3	1.6
	13 01	20 30	14 25	7 29	1 24	5.1	1.7
23..........	(1 27)	9 00	2 30	(7 33)	(1 03)	5.5	1.8
	13 53	21 00	15 00	7 07	1 07	5.0	2.0
24..........	(2 18)	9 40	3 00	(7 22)	(0 42)	5.3	1.8
	14 44	22 00	16 00	7 16	1 16	4.5	1.9
25..........	(3 09)	10 40	4 10	(7 31)	(1 01)	4.9	1.8
	15 35	23 00	17 10	7 25	1 35	4.2	2.0
26..........	(4 00)	11 30	5 15	(7 30)	(1 15)	4.7	1.9
	16 25	23 45	18 10	7 20	1 45	4.0	2.1
27..........	(4 50)	.. ..	6 00	. ..	(1 10)	. .	2.0
	17 14	12 25	19 00	(7 35)	1 46	4.6	2.2

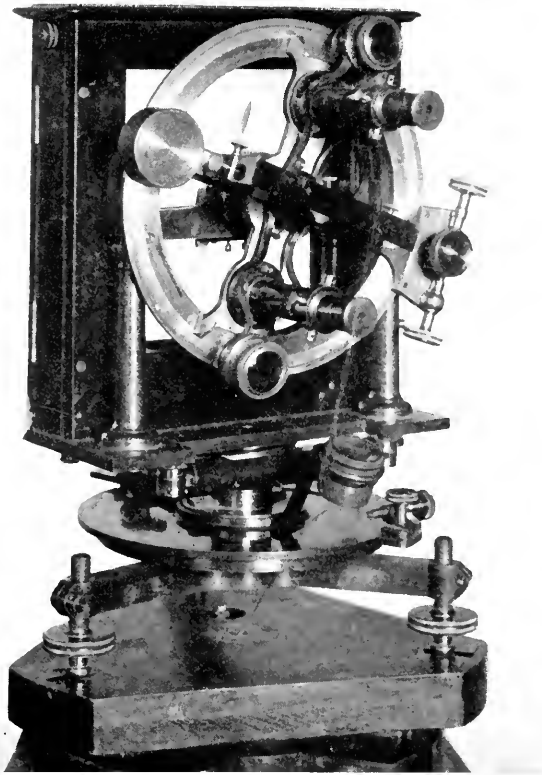

FIG. 1.—KEW-CASELLA DIP CIRCLE

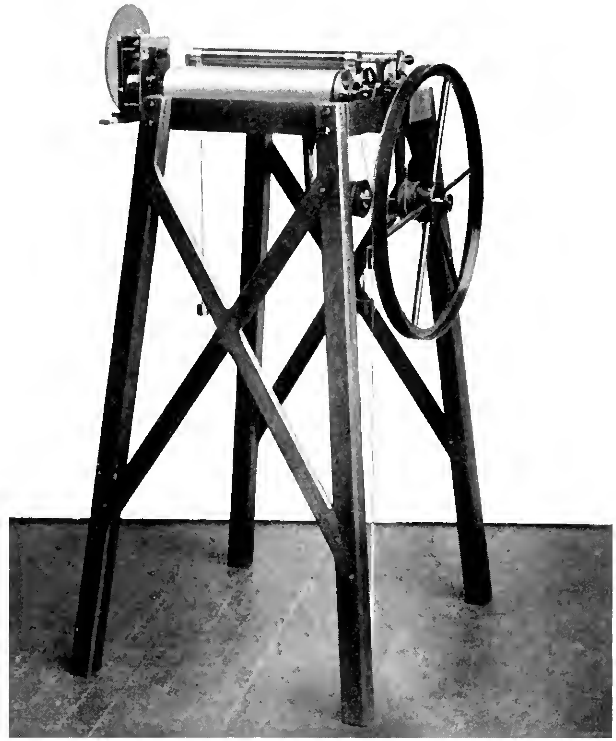

FIG. 2.—SEXTON TIDE GAUGE

VIEWS OF PHYSICAL APPARATUS

FIRST REDUCTION.—Continued.

Date. Year 1903.	Moon's Transits.	Time of— High Water.	Time of— Low Water.	Lunitidal Interval. High Water.	Lunitidal Interval. Low Water.	Height of— High Water.	Height of— Low Water.
mo. d.	h. m.	h. m.	h. m.	h. m.	h. m.	feet.	feet.
Sept. 28..........	(5 39)	0 45	6 40	7 31	(1 01)	4.0	2.1
	18 03	13 25	20 00	(7 46)	1 57	4.4	2.2
29..........	(6 26)	1 50	7 40	7 47	(1 14)	3.9	2.3
	18 50	14 20	20 45	(7 54)	1 55	4.4	2.4
30..........	(7 13)	2 35	8 50	7 45	(1 37)	3.9	2.2
	19 36	15 15	21 50	(8 02)	2 14	4.4	2.3
Half monthly sums..........................				[27] 190 851	[27] 26 702	[27] 128.1	[27] 50.6
Oct. 1..........	(7 59)	3 25	9 50	7 49	(1 51)	3.9	2.2
	20 22	16 15	22 25	(8 16)	2 03	4.4	2.3
2..........	(8 44)	4 25	10 50	8 03	(2 06)	4.1	2.1
	21 06	17 00	23 20	(8 16)	2 14	4.5	2.2
3..........	(9 28)	5 15	(11 30)	8 09	(2 02)	4.3	(2.2)
	21 50	(17 40)	23 50	(8 12)	2 00	(4.8)	2.4
4..........	(10 12)	5 40	.. ..	7 50	. ..	4.8	. .
	22 34	18 15	12 10	(8 03)	(1 58)	4.8	2.3
5..........	(10 57)	6 25	0 20	7 51	1 46	4.8	2.1
	23 19	19 00	13 00	(8 03)	(2 03)	4.7	2.1
6..........	(11 42)	7 10	1 00	7 51	1 41	5.0	2.2
	.. ..	19 20	13 35	(7 38)	(1 53)	4.8	2.3
7..........	0 06	7 50	1 30	7 44	1 24	5.1	2.1
	(12 29)	19 50	14 00	(7 21)	(1 31)	4.7	2.1
8..........	0 53	8 30	2 10	7 37	1 17	5.1	2.0
	(13 18)	20 50	14 40	(7 32)	(1 22)	4.7	2.0
9..........	1 43	9 15	2 35	7 32	0 52	5.4	2.1
	(14 09)	21 30	15 35	(7 21)	(1 26)	4.7	2.3
10..........	2 35	10 10	3 35	7 35	1 00	5.4	2.2
	(15 02)	22 00	16 35	(6 58)	(1 33)	4.7	2.4
11..........	3 30	10 45	4 20	7 15	0 50	5.3	2.2
	(15 58)	22 45	17 15	(6 47)	(1 17)	4.4	2.2
12..........	4 26	11 25	(5 15)	6 59	0 49	4.8	(1.9)
	(16 54)	.. ..	18 15	. ..	(1 21)	. .	2.0
13..........	5 22	0 00	6 15	(7 06)	0 53	4.0	1.6
	(17 51)	12 40	19 15	7 18	(1 24)	4.5	1.7
14..........	6 19	1 10	7 10	(7 19)	0 51	4.0	1.9
	(18 47)	13 50	20 25	7 31	(1 38)	4.8	2.2
15..........	7 15	2 15	8 25	(7 28)	1 10	4.5	2.0
	(19 43)	14 50	21 00	7 35	(1 17)	4.9	2.0
16..........	8 10	3 00	9 20	(7 17)	1 10	4.6	1.9
	(20 37)	15 50	22 10	7 40	(1 33)	4.9	1.9
Half monthly sums..........................				[41] 221 895	[31] 32 855	[31] 145.4	[31] 65.1
17..........	9 04	(4 00)	10 40	(7 23)	1 36	(5.0)	1.8
	(21 30)	16 50	(22 50)	7 46	(1 20)	5.0	(1.7)
18..........	9 56	(4 55)	11 20	(7 25)	1 24	(5.1)	1.6
	(22 22)	17 40	23 35	7 44	(1 13)	4.9	1.6
19..........	10 48	(5 50)	.. ..	(7 28)	. ..	(5.2)	. .
	(23 14)	18 40	12 25	7 52	1 37	4.9	1.6
20..........	11 40	(6 45)	0 25	(7 31)	(1 11)	(5.3)	1.6
	.. ..	19 20	13 25	7 40	1 45	4.9	1.7

FIRST REDUCTION.—Continued.

Date. Year 1903.	Moon's Transits.	Time of— High Water.	Time of— Low Water.	Lunitidal Interval. High Water.	Lunitidal Interval. Low Water.	Height of— High Water.	Height of— Low Water.
mo. d.	h. m.	h. m.	h. m.	h. m.	h. m.	feet.	feet.
Oct. 21..........	(0 05)	(7 45)	(1 15)	(7 40)	(1 10)	(5.4)	(1.6)
	12 31	20 00	14 00	7 29	1 29	4.7	1.7
22..........	(0 57)	8 40	2 00	(7 43)	(1 03)	5.3	1.6
	13 23	20 50	15 00	7 27	1 37	4.5	1.8
23..........	(1 48)	9 20	2 50	(7 32)	(1 02)	5.2	1.8
	14 14	21 40	15 50	7 26	1 36	4.3	2.0
24..........	(2 39)	10 20	3 40	(7 41)	(1 01)	5.0	1.9
	15 05	22 30	16 40	7 25	1 35	4.0	2.0
25..........	(3 30)	11 00	4 25	(7 30)	(0 55)	4.5	1.9
	15 54	23 15	17 25	7 21	1 31	3.7	1.9
26..........	(4 19)	11 40	5 25	(7 21)	(1 06)	4.3	1.9
	16 43	.. ..	18 10	. ..	1 27	. .	2.0
27..........	(5 06)	0 00	6 00	7 17	(0 54)	3.6	2.0
	17 30	12 25	19 00	(7 19)	1 30	4.1	2.0
28..........	(5 53)	1 00	7 00	7 30	(1 07)	3.7	2.2
	18 16	13 20	19 50	(7 27)	1 34	4.1	2.2
29..........	(6 38)	1 50	8 25	7 34	(1 47)	3.8	2.3
	19 00	14 30	20 50	(7 52)	1 50	4.1	2.1
30..........	(7 22)	3 00	9 00	8 00	(1 38)	3.8	2.1
	19 44	15 10	21 45	(7 48)	2 01	4.1	2.0
31..........	(8 06)	3 40	10 00	7 56	(1 54)	3.9	2.1
	20 28	16 00	22 25	(7 54)	1 57	4.0	1.8
Half monthly sums..........................				29 204 961	29 28 830	29 130.4	29 54.5
Nov. 1..........	(8 50)	4 35	10 50	8 07	(2 00)	3.9	1.8
	21 12	16 50	22 50	(8 00)	1 38	4.0	1.7
2..........	(9 35)	5 15	11 35	8 03	(2 00)	4.3	1.8
	21 58	17 25	23 35	(7 50)	1 37	4.1	1.5
3..........	(10 22)	5 50	.. ..	7 52	. ..	4.4	. .
	22 46	18 00	12 25	(7 38)	(2 03)	4.0	1.6
4..........	(11 10)	6 30	0 00	7 44	1 14	4.8	1.5
	23 35	19 00	13 00	(7 50)	(1 50)	4.4	1.8
5..........	.. ..	7 10	0 45	7 35	1 10	5.0	1.6
	(12 01)	19 25	13 35	(7 24)	(1 34)	4.3	1.7
6..........	0 28	(8 00)	(1 30)	7 32	1 02	(5.0)	(1.5)
	(12 55)	20 10	14 25	(7 15)	(1 30)	4.3	1.7
7..........	1 23	8 45	2 10	7 22	0 47	5.0	1.4
	(13 51)	21 00	15 15	(7 09)	(1 24)	4.0	1.5
8..........	2 20	9 30	3 10	7 10	0 50	4.9	1.3
	(14 48)	22 00	16 15	(7 12)	(1 27)	3.9	1.5
9..........	3 18	10 25	4 00	7 07	0 42	4.9	1.5
	(15 46)	23 00	17 00	(7 14)	(1 14)	4.0	1.5
10..........	4 15	11 20	5 00	7 05	0 45	4.8	1.6
	(16 44)	.. ..	18 00	. ..	(1 16)	. .	1 7
11..........	5 11	0 00	5 45	(7 16)	0 34	4.0	1.6
	(17 39)	12 15	19 00	7 04	(1 21)	4.6	1.6
12..........	6 06	1 00	7 00	(7 21)	0 54	4.1	1.7
	(18 33)	13 20	20 00	7 14	(1 27)	4.4	1.5
13..........	6 59	2 15	8 15	(7 42)	1 16	4.1	1.7
	(19 25)	14 30	21 00	7 31	(1 35)	4.3	1.5

FIRST REDUCTION.—Continued.

Date. Year 1903.	Moon's Transits.	Time of— High Water.	Time of— Low Water.	Lunitidal Interval. High Water.	Lunitidal Interval. Low Water.	Height of— High Water.	Height of— Low Water.
mo. d.	h. m.	h. m.	h. m.	h. m.	h. m.	feet.	feet.
Nov. 14..........	7 50	3 20	9 30	(7 55)	1 40	4.3	1.7
	(20 16)	15 25	22 00	7 35	(1 44)	4.3	1.4
15..........	8 41	4 15	10 30	(7 59)	1 49	4.6	1.7
	(21 06)	16 25	22 50	7 44	(1 44)	4.3	1.4
16..........	9 31	5 10	11 30	(8 04)	1 59	4.8	1.6
	(21 56)	17 25	23 40	7 54	(1 44)	4.3	1.5
Half monthly sums..........				31 221 808	31 28 950	31 136.1	31 49.1
17..........	10 22	6 00	.. ..	(8 04)	. ..	5.0	. .
	(22 47)	18 10	12 20	7 48	1 58	4.4	1.7
18..........	11 12	7 00	0 30	(8 13)	(1 43)	5.0	1.5
	(23 38)	19 00	13 10	7 48	1 58	4.1	1.6
19..........	.. ..	7 30	1 15	(7 52)	(1 37)	5.0	1.4
	12 03	19 45	13 50	7 42	1 47	4.1	1.6
20..........	(0 29)	8 25	1 50	(7 56)	(1 21)	5.0	1.6
	12 54	20 45	14 40	7 51	1 46	3.9	1.7
21..........	(1 20)	9 00	2 25	(7 40)	(1 05)	4.7	1.5
	13 45	21 00	15 15	7 15	1 30	3.9	1.7
22..........	(2 10)	9 45	3 15	(7 35)	(1 05)	4.8	1.7
	14 34	22 00	16 15	7 26	1 41	3.9	1.9
23..........	(2 59)	10 25	3 50	(7 26)	(0 51)	4.6	1.9
	15 22	22 50	16 40	7 28	1 18	3.8	2.0
24..........	(3 46)	11 00	4 45	(7 14)	(0 59)	4.4	2.0
*	16 09	23 30	17 40	7 21	1 31	3.6	2.0
25..........	(4 32)	11 40	5 20	(7 08)	(0 48)	4.2	2.0
	16 54	.. ..	18 20	. ..	1 26	. .	2.0
26..........	(5 16)	0 25	6 15	7 31	(0 59)	3.8	2.2
	17 38	12 30	19 00	(7 14)	1 22	4.3	2.1
27..........	(6 00)	1 20	7 30	7 42	(1 30)	3.9	2.3
	18 22	13 30	20 00	(7 30)	1 38	4.0	2.0
28..........	(6 43)	2 10	8 20	7 48	(1 37)	3.8	2.1
	19 05	14 30	20 40	(7 47)	1 35	3.9	1.9
29..........	(7 27)	3 00	9 45	7 55	(2 18)	4.2	2.2
	19 49	15 00	21 25	(7 33)	1 36	4.0	1.8
30..........	(8 12)	3 40	10 00	7 51	(1 48)	4.2	2.0
	20 35	16 00	22 15	(7 48)	1 40	4.0	1.7
Half monthly sums..........				27 191 926	27 24 987	27 114.5	27 50.1
Dec. 1..........	(8 59)	4 35	11 00	8 00	(2 01)	4.5	1.9
	21 23	17 00	23 00	(8 01)	1 37	3.9	1.5
2..........	(9 48)	5 20	.. ..	7 57	. ..	4.6	. .
	22 15	17 35	12 00	(7 47)	(2 12)	4.0	1.7
3..........	(10 41)	6 20	0 00	8 05	1 45	4.8	1.4
	23 09	18 25	13 00	(7 44)	(2 19)	3.9	1.4
4..........	(11 38)	7 00	0 35	7 51	1 26	5.0	1.2
	.. ..	19 00	13 30	(7 22)	(1 52)	4.0	1.5
5..........	0 06	7 50	1 20	7 44	1 14	5.0	1.1
	(12 36)	20 00	14 25	(7 24)	(1 49)	4.0	1.1
6..........	1 06	8 25	2 10	7 19	1 04	5.0	0.9
	(13 36)	20 50	15 00	(7 14)	(1 24)	4.0	1.1

FIRST REDUCTION.—Continued.

Date. Year 1903.	Moon's Transits.	Time of— High Water.	Time of— Low Water.	Lunitidal Interval. High Water.	Lunitidal Interval. Low Water.	Height of— High Water.	Height of— Low Water.
mo. d.	h. m.	h. m.	h. m.	h. m.	h. m.	feet.	feet.
Dec. 7..........	2 06	9 20	3 00	7 14	0 54	5.1	1.0
	(14 35)	(21 40)	(15 55)	(7 05)	(1 20)	(4.1)	(1.2)
8..........	3 05	10 10	(3 50)	7 05	0 45	5.0	(1.2)
	(15 33)	22 35	16 50	(7 02)	(1 17)	4.2	1.3
9..........	4 02	11 00	4 40	6 58	0 38	4.9	1.5
	(16 29)	(23 40)	18 00	(7 11)	(1 31)	(4.2)	1.5
10..........	4 56	11 50	(5 35)	6 54	0 39	4.6	(1.5)
	(17 22)	.. ..	19 00	. ..	(1 38)	. .	1.3
11..........	5 48	0 50	6 30	(7 28)	0 42	4.2	1.6
	(18 14)	13 00	19 50	7 12	(1 36)	4.2	1.3
12..........	6 39	2 00	8 00	(7 46)	1 21	4.2	1.7
	(19 04)	14 00	21 00	7 21	(1 56)	4.0	1.3
13..........	7 28	3 00	9 15	(7 56)	1 47	4.4	1.6
	(19 53)	15 10	21 45	7 42	(1 52)	3.9	1.2
14..........	8 18	(3 55)	(10 15)	(8 02)	1 57	(4.5)	(1.6)
	(20 42)	(16 10)	22 35	7 52	(1 53)	(3.9)	1.2
15..........	9 07	4 50	11 15	(8 08)	2 08	4.5	1.6
	(21 32)	17 10	(23 15)	8 03	(1 43)	3.9	(1.2)
16..........	9 57	(5 40)	.. ..	(8 08)	. ..	(4.6)	. .
	(22 22)	17 50	(12 10)	7 53	2 13	3.9	(1.6)
Half monthly sums..........................				31 222 808	30 30 993	31 135 0	30 41.2
17..........	10 47	6 30	0 00	(8 08)	(1 38)	4.7	1.3
	(23 12)	18 45	13 00	7 58	2 13	3.9	1.5
18..........	11 37	7 10	0 50	(7 58)	(1 38)	4.7	1.3
	.. ..	19 10	14 00	7 33	2 23	3.8	1.4
19..........	(0 02)	8 10	1 35	(8 08)	(1 33)	4.6	1.2
	12 27	20 00	14 30	7 33	2 03	3.5	1.3
20..........	(0 52)	8 30	2 10	(7 38)	(1 18)	4.5	1.3
	13 16	20 50	15 00	7 34	1 44	3.6	1.4
21..........	(1 40)	9 15	2 45	(7 35)	(1 05)	4.3	1.2
	14 03	21 35	15 40	7 32	1 37	3.5	1.4
22..........	(2 26)	10 00	3 30	(7 34)	(1 04)	4.3	1.4
	14 49	22 15	16 20	7 26	1 31	3.6	1.5
23..........	(3 12)	10 30	4 00	(7 18)	(0 48)	4.2	1.7
	15 34	(22 55)	17 10	7 21	1 36	(3.5)	1.6
24..........	(3 55)	(11 10)	(4 45)	(7 15)	(0 50)	(4.1)	(1.9)
	16 17	(23 35)	(17 45)	7 18	1 28	(3.6)	(1.8)
25..........	(4 38)	(11 55)	(5 30)	(7 17)	(0 52)	(4.0)	(2.0)
	17 00	.. ..	(18 25)	. ..	1 25	. .	(1.9)
26..........	(5 21)	(0 20)	(6 15)	7 20	(0 54)	(3.7)	(2.0)
	17 43	(12 35)	19 00	(7 14)	1 17	(3.8)	1.7
27..........	(6 05)	1 00	7 00	7 17	(0 55)	3.6	1.9
	18 27	13 20	19 45	(7 15)	1 18	3.6	1.5
28..........	(6 49)	2 15	(8 15)	7 48	(1 26)	3.8	(1.8)
	19 12	(14 20)	20 45	(7 31)	1 33	(3.6)	1.5
29..........	(7 36)	3 10	9 30	7 58	(1 54)	3.9	1.8
	20 01	15 15	21 40	(7 39)	1 39	3.5	1.3
30..........	(8 26)	4 00	10 30	7 59	(2 04)	4.1	1.7
	20 53	16 10	22 40	(7 44)	1 47	3.6	1.1
31..........	(9 20)	5 00	11 35	8 07	(2 15)	4.3	1.5
	21 48	17 18	23 30	(7 58)	1 42	3.5	1.0
Half monthly sums..........................				29 206 896	30 30 930	29 113.4	30 45.9

FIRST REDUCTION.—Continued.

Date. Year 1904.	Moon's Transits.	Time of— High Water.	Time of— Low Water.	Lunitidal Interval. High Water.	Lunitidal Interval. Low Water.	Height of— High Water.	Height of— Low Water.
mo. d.	h. m.	h. m.	h. m.	h. m.	h. m.	feet.	feet.
Jan. 1..........	(10 17)	5 45	.. ..	7 57	...	4.5	..
	22 47	17 50	12 25	(7 32)	(2 08)	3.8	1.4
2..........	(11 17)	6 40	0 15	7 53	1 28	4.9	1.0
	23 48	18 45	13 15	(7 28)	(1 58)	3.9	1.3
3..........	.. ..	7 25	1 00	7 37	1 12	5.0	0.9
	(12 18)	19 35	14 10	(7 17)	(1 52)	4.2	1.2
4..........	0 49	8 15	2 00	7 26	1 11	5.2	0.9
	(13 19)	20 30	15 00	(7 11)	(1 41)	4.0	1.1
5..........	1 49	9 20	2 40	7 31	0 51	5.0	0.9
	(14 18)	21 30	15 45	(7 12)	(1 27)	4.0	1.0
6..........	2 47	9 50	3 40	7 03	0 53	4.8	1.0
	(15 15)	22 30	16 30	(7 15)	(1 15)	4.1	0.9
7..........	3 42	10 50	4 30	7 08	0 48	4.6	1.1
	(16 09)	23 35	17 15	(7 26)	(1 06)	4.4	1.2
8..........	4 35	11 45	5 35	7 10	1 00	4.5	1.6
	(17 01)	.. ..	18 20	...	(1 19)	..	1.3
9..........	5 26	0 30	6 30	(7 29)	1 04	4.3	1.6
	(17 51)	12 40	19 10	7 14	(1 19)	4.2	1.3
10..........	6 16	1 20	7 45	(7 29)	1 29	4.2	1.6
	(18 40)	13 40	20 00	7 24	(1 20)	3.7	1.1
11..........	7 05	2 30	8 50	(7 50)	1 45	4.2	1.6
	(19 30)	14 45	21 00	7 40	(1 30)	3.7	1.2
12..........	7 54	3 30	10 00	(8 00)	2 06	4.3	1.6
	(20 19)	15 50	21 55	7 56	(1 36)	3.6	1.2
13..........	8 44	4 20	11 10	(8 01)	2 26	4.3	1.5
	(21 09)	16 50	22 40	8 06	(1 31)	3.7	1.3
14..........	9 34	5 10	12 00	(8 01)	2 26	4.3	1.5
	(21 58)	17 15	23 45	7 41	(1 47)	3.4	1.1
15..........	10 23	6 00	.. ..	(8 02)	...	4.2	..
	(22 47)	18 15	12 25	7 52	2 02	3.3	1.2
16..........	11 12	6 50	0 20	(8 03)	(1 33)	4.3	1.1
	(23 36)	19 00	13 20	7 48	2 08	3.5	1.4
Half monthly sums..........................				31 223 763	30 33 791	31 130.1	30 37.1
17..........	11 59	7 30	0 50	(7 54)	(1 14)	4.3	1.1
	.. ..	19 45	13 35	7 46	1 36	3.6	1.3
18..........	(0 23)	8 10	1 30	(7 47)	(1 07)	4.4	1.3
	12 46	20 10	14 25	7 24	1 39	3.5	1.3
19..........	(1 08)	8 50	2 15	(7 42)	(1 07)	4.3	1.3
	13 31	21 00	15 15	7 29	1 44	3.4	1.4
20..........	(1 53)	9 30	3 10	(7 37)	(1 17)	3.9	1.2
	14 14	21 35	15 50	7 21	1 36	3.4	1.3
21..........	(2 36)	9 55	3 40	(7 19)	(1 04)	4.2	1.4
	14 57	22 20	16 15	7 23	1 18	3.8	1.6
22..........	(3 19)	10 30	4 30	(7 11)	(1 11)	4.1	1.8
	15 40	22 50	16 45	7 10	1 05	3.7	1.6
23..........	(4 01)	11 00	4 50	(6 59)	(0 49)	3.9	1.8
	16 23	23 35	17 10	7 12	0 47	3.8	1.5
24..........	(4 45)	11 35	6 00	(6 50)	(1 15)	3.6	1.7
	17 07	.. ..	18 00	...	0 53	..	1.4

FIRST REDUCTION.—Continued.

Date. Year 1904.	Moon's Transits.	Time of— High Water.	Time of— Low Water.	Lunitidal Interval. High Water.	Lunitidal Interval. Low Water.	Height of— High Water.	Height of— Low Water.
mo. d.	h. m.	h. m.	h. m.	h. m.	h. m.	feet.	feet.
Jan. 25..........	(5 30)	0 30	6 50	7 23	(1 20)	3.8	1.8
	17 53	12 25	19 00	(6 55)	1 07	3.6	1.4
26..........	(6 16)	1 30	7 45	7 37	(1 29)	3.8	1.7
	18 41	13 25	19 50	(7 09)	1 09	3.4	1.4
27..........	(7 07)	2 15	8 40	7 34	(1 33)	4.0	1.9
	19 33	14 15	20 35	(7 08)	1 02	3.5	1.4
28..........	(8 00)	3 15	(9 40)	7 42	(1 40)	4.2	(1.7)
	20 28	(15 20)	21 35	(7 20)	1 07	(3.6)	1.3
29..........	(8 57)	4 15	10 45	7 47	(1 48)	4.4	1.6
	21 26	16 30	22 25	(7 33)	0 59	3.7	1.0
30..........	(9 56)	5 10	11 30	7 44	(1 34)	4.6	1.4
	22 27	17 10	23 30	(7 14)	1 03	3.8	0.8
31..........	(10 58)	6 00	.. ..	7 33	. ..	5.0	. .
	23 28	18 20	12 35	(7 22)	(1 37)	4.3	1.4
Half monthly sums..........................				29 200 905	29 25 730	29 113.6	29 41.8
Feb. 1..........	(11 58)	7 00	0 25	7 32	0 57	5.2	0.9
	.. ..	19 20	13 40	(7 22)	(1 42)	4.1	0.9
2..........	0 28	7 50	1 20	7 22	0 52	4.9	0.5
	(12 58)	(20 15)	(14 25)	(7 17)	(1 27)	(4.3)	(0.7)
3..........	1 27	8 50	(2 20)	7 23	0 53	4.8	(0.6)
	(13 55)	21 10	15 15	(7 15)	(1 20)	4.4	0.8
4..........	2 23	9 35	3 20	7 12	0 57	4.5	0.7
	(14 50)	22 10	15 50	(7 20)	(1 00)	4.1	0.6
5..........	3 17	10 20	4 15	7 03	0 58	4.2	0.8
	(15 43)	23 00	16 40	(7 17)	(0 57)	4.1	0.7
6..........	4 09	11 10	5 10	7 01	1 01	3.9	1.0
	(16 35)	.. ..	17 35	. ..	(1 00)	. .	0.8
7..........	5 00	0 00	6 10	(7 25)	1 10	4.0	1.3
	(17 26)	12 00	18 30	7 00	(1 04)	3.7	1.0
8..........	5 51	1 00	7 20	(7 34)	1 29	4.0	1.4
	(18 16)	13 15	19 25	7 24	(1 09)	3.4	1.1
9..........	6 41	2 00	8 25	(7 44)	1 44	3.9	1.5
	(19 06)	14 25	20 25	7 44	(1 19)	3.3	1.3
10..........	7 31	3 00	9 20	(7 54)	1 49	4.1	1.7
	(19 56)	15 25	(21 20)	7 54	(1 24)	3.5	(1.4)
11..........	8 20	(4 00)	10 30	(8 04)	2 10	(4.2)	1.7
	(20 45)	16 20	22 15	8 00	(1 30)	3.4	1.5
12..........	9 09	5 00	11 35	(8 15)	2 26	4.2	1.8
	(21 33)	17 15	23 20	8 06	(1 47)	3.6	1.5
13..........	9 56	5 50	.. ..	(8 17)	. ..	4.3	. .
	(22 20)	18 00	12 10	8 04	2 14	3.5	1.6
14..........	10 43	6 30	0 00	(8 10)	(1 40)	4.1	1.1
	(23 06)	(18 40)	12 35	7 57	1 52	(3.7)	1.3
15..........	11 28	(7 05)	(0 40)	(7 59)	(1 34)	(4.2)	(1.2)
	(23 51)	(19 20)	13 30	7 52	2 02	(3.9)	1.6
16..........	.. ..	(7 35)	(1 20)	(7 44)	(1 29)	(4.3)	(1.3)
	12 13	20 00	(14 00)	7 47	1 47	4.0	(1.5)
Half monthly sums..........................				31 224 778	31 29 943	31 125.8	31 35.8

FIG. 1.—VIEW OF BOAT CAMBER AND TIDE GAUGE HOUSE, NASSAU

FIG. 2.—VIEW OF BENCH MARK NO. 1 AND MONUMENT, NASSAU

VIEWS ILLUSTRATING WORK ON TIDES AND BENCH MARKS

FIRST REDUCTION.—Continued.

Date. Year 1904.	Moon's Transits.	Time of— High Water.	Time of— Low Water.	Lunitidal Interval. High Water.	Lunitidal Interval. Low Water.	Height of— High Water.	Height of— Low Water.
mo. d.	h. m.	h. m.	h. m.	h. m.	h. m.	feet.	feet.
Feb. 17..........	(0 34)	8 10	2 00	(7 36)	(1 26)	4.3	1.4
	12 56	20 30	14 25	7 34	1 29	3.9	1.4
18..........	(1 17)	8 50	2 30	(7 33)	(1 13)	4.0	1.3
	13 39	21 10	15 00	7 31	1 21	3.7	1.3
19..........	(2 00)	9 20	3 15	(7 20)	(1 15)	3.9	1.2
	14 22	21 35	15 20	7 13	0 58	3.9	1.4
20..........	(2 43)	9 50	3 40	(7 07)	(0 57)	4.0	1.6
	15 05	22 10	16 00	7 05	0 55	4.0	1.5
21..........	(3 27)	10 20	4 20	(6 53)	(0 53)	3.8	1.7
	15 50	23 00	16 40	7 10	0 50	4.0	1.4
22..........	(4 13)	11 15	5 25	(7 02)	(1 12)	3.6	1.7
	16 36	23 45	17 25	7 09	0 49	3.8	1.4
23..........	(5 00)	.. ..	6 10	. ..	(1 10)	. .	1.5
	17 25	12 00	18 00	(7 00)	0 35	3.4	1.3
24..........	(5 51)	0 50	6 50	7 25	(0 59)	3.8	1.7
	18 17	12 50	19 00	(6 59)	0 43	3.5	1.5
25..........	(6 44)	1 35	7 50	7 18	(1 06)	4.0	1.7
	19 12	(14 00)	(20 00)	(7 16)	0 48	(3.3)	(1.3)
26..........	(7 40)	(2 45)	9 10	7 33	(1 30)	(4.2)	1.7
	20 09	15 00	21 00	(7 20)	0 51	3.6	1.4
27..........	(8 38)	3 50	10 10	7 41	(1 32)	4.4	1.6
	21 08	16 15	22 20	(7 37)	1 12	3.7	1.1
28..........	(9 38)	4 50	(11 00)	7 42	(1 22)	4.5	(1.3)
	22 07	(17 15)	(23 10)	(7 37)	1 03	(4.1)	(1.0)
29..........	(10 37)	(5 40)	(11 55)	7 33	(1 18)	(4.7)	(1.0)
	23 06	18 10	.. ..	(7 33)	. ..	4.4	. .
Half monthly sums..........................				25 173 647	25 14 807	25 98.5	25 35.4
Mar. 1..........	(11 35)	6 30	0 00	7 24	0 54	4.9	0.9
	.. ..	19 15	12 45	(7 40)	(1 10)	4.5	0.8
2..........	0 04	7 25	1 15	7 21	1 11	4.8	0.7
	(12 32)	19 50	13 45	(7 18)	(1 13)	4.7	0.8
3..........	1 00	8 15	2 00	7 15	1 00	4.9	0.8
	(13 28)	20 50	14 35	(7 22)	(1 07)	4.9	0.9
4..........	1 55	9 20	3 00	7 25	1 05	4.7	1.1
	(14 22)	21 45	15 25	(7 23)	(1 03)	4.7	1.0
5..........	2 48	10 00	3 50	7 12	1 02	4.4	1.1
	(15 15)	22 30	16 00	(7 15)	(0 45)	4.8	1.1
6..........	3 41	10 45	(5 00)	7 04	1 19	4.1	(1.4)
	(16 08)	23 25	17 00	(7 17)	(0 52)	4.6	1.3
7..........	4 34	11 35	(5 55)	7 01	1 21	4.0	(1.6)
	(16 59)	.. ..	17 50	. ..	(0 51)	. .	1.4
8..........	5 25	0 15	6 45	(7 16)	1 20	4.5	1.8
	(17 50)	12 40	18 50	7 15	(1 00)	3.9	1.7
9..........	6 15	1 30	7 50	(7 40)	1 35	4.4	1.9
	(18 40)	14 00	19 50	7 45	(1 10)	3.8	1.7
10..........	7 05	2 20	8 45	(7 40)	1 40	4.1	1.9
	(19 29)	14 40	20 40	7 35	(1 11)	3.4	1.6
11..........	7 53	3 20	10 00	(7 51)	2 07	4.1	1.8
	(20 17)	16 00	21 45	8 07	(1 28)	3.6	1.8

FIRST REDUCTION.—Continued.

Date. Year 1904.	Moon's Transits.	Time of— High Water.	Time of— Low Water.	Lunitidal Interval. High Water.	Lunitidal Interval. Low Water.	Height of— High Water.	Height of— Low Water.
mo. d.	h. m.	h. m.	h. m.	h. m.	h. m.	feet.	feet.
Mar. 12..........	8 40	4 25	10 40	(8 08)	2 00	4.2	2.0
	(21 03)	16 50	22 30	8 10	(1 27)	3.8	1.8
13..........	9 26	5 20	11 30	(8 17)	2 04	4.3	1.8
	(21 48)	17 35	23 25	8 09	(1 37)	3.9	1.8
14..........	10 10	5 50	.. ..	(8 02)	. ..	4.3	. .
	(22 32)	18 00	12 10	7 50	2 00	4.0	1.8
15..........	10 54	6 25	0 10	(7 53)	(1 38)	4.1	1.6
	(23 16)	19 00	12 35	8 06	1 41	3.9	1.4
16..........	11 37	7 30	1 00	(8 14)	(1 44)	4.2	1.4
	(23 58)	19 25	13 35	7 48	1 58	4.1	1.6
Half monthly sums..........................				31 225 703	31 31 693	31 132.6	31 44.3
17..........	.. ..	7 45	1 40	(7 47)	(1 42)	4.0	1.3
	12 20	19 50	13 35	7 30	1 15	4.0	1.3
18..........	(0 42)	8 00	(2 25)	(7 18)	(1 43)	4.0	(1.4)
	13 04	20 40	14 10	7 36	1 06	4.4	1.4
19..........	(1 26)	9 10	3 10	(7 44)	(1 44)	4.1	1.6
	13 48	21 10	15 00	7 22	1 12	4.5	1.5
20..........	(2 11)	9 20	3 30	(7 09)	(1 19)	4.0	1.7
	14 34	21 45	15 25	7 11	0 51	4.4	1.4
21..........	(2 58)	10 00	4 00	(7 02)	(1 02)	4.0	1.7
	15 22	22 25	16 00	7 03	0 38	4.3	1.4
22..........	(3 47)	10 40	5 00	(6 53)	(1 13)	3.7	1.6
	16 13	23 15	16 35	7 02	0 22	4.3	1.4
23..........	(4 39)	11 25	6 00	(6 46)	(1 21)	3.6	1.7
	17 06	.. ..	17 25	. ..	0 19	. .	1.4
24..........	(5 33)	0 20	6 35	7 14	(1 02)	4.3	1.7
	18 00	12 20	18 30	(6 47)	0 30	3.5	1.5
25..........	(6 28)	1 10	7 50	7 10	(1 22)	4.4	1.7
	18 56	13 30	19 30	(7 02)	0 34	3.6	1.6
26..........	(7 25)	2 10	8 50	7 14	(1 25)	4.4	1.8
	19 54	14 50	20 40	(7 25)	0 46	3.8	1.6
27..........	(8 22)	3 25	9 50	7 31	(1 28)	4.5	1.7
	20 50	16 00	21 50	(7 38)	1 00	4.0	1.6
28..........	(9 19)	4 25	10 40	7 35	(1 21)	4.9	1.7
	21 47	16 50	22 45	(7 31)	0 58	4.5	1.5
29..........	(10 15)	5 20	11 30	7 33	(1 15)	4.9	1.4
	22 42	17 50	.. ..	(7 35)	. ..	5.0	. .
30..........	(11 10)	6 10	0 00	7 28	1 18	5.0	1.3
	23 38	18 35	12 30	(7 25)	(1 20)	4.9	1.1
31..........	.. ..	7 10	0 50	7 32	1 12	4.7	1.0
	(12 05)	19 35	13 15	(7 30)	(1 10)	4.9	0.7
Half monthly sums..........................				29 200 753	29 21 688	29 124.6	29 42.7
Apr. 1..........	0 32	7 50	1 50	7 18	1 18	4.5	0.9
	(12 59)	20 25	14 00	(7 26)	(1 01)	5.0	0.8
2..........	1 26	8 40	2 50	7 14	1 24	4.3	1.1
	(13 53)	21 10	14 45	(7 17)	(0 52)	4.9	0.8
3..........	2 20	9 30	3 40	7 10	1 20	4.1	1.1
	(14 47)	22 10	15 40	(7 23)	(0 53)	4.7	1.0

FIRST REDUCTION.—Continued.

Date. Year 1904.	Moon's Transits.	Time of— High Water.	Time of— Low Water.	Lunitidal Interval. High Water.	Lunitidal Interval. Low Water.	Height of— High Water.	Height of— Low Water.
mo. d.	h. m.	h. m.	h. m.	h. m.	h. m.	feet.	feet.
Apr. 4.........	3 13	10 15	4 25	7 02	1 12	3.9	1.3
	(15 40)	22 50	16 15	(7 10)	(0 35)	4.4	1.3
5..........	4 06	11 20	5 25	7 14	1 19	3.7	1.5
	(16 32)	23 40	17 25	(7 08)	(0 53)	4.2	1.4
6..........	4 57	.. ..	6 25	. ..	1 28	. .	1.6
	(17 22)	12 00	18 10	7 03	(0 48)	3.5	1.6
7..........	5 47	0 35	7 10	(7 13)	1 23	4.2	1.9
	(18 11)	13 00	19 10	7 13	(0 59)	3.7	1.9
8..........	6 35	1 30	8 10	(7 19)	1 35	4.2	1.9
	(18 59)	14 15	20 10	7 40	(1 11)	3.6	1.9
9..........	7 22	2 40	9 00	(7 41)	1 38	4.1	2.0
	(19 44)	15 10	21 00	7 48	(1 16)	3.7	2.0
10..........	8 07	3 25	9 50	(7 41)	1 43	4.1	1.9
	(20 29)	16 10	22 10	8 03	(1 41)	3.6	1.8
11..........	8 51	4 20	10 35	(7 51)	1 44	3.9	1.7
	(21 12)	16 45	22 45	7 54	(1 33)	3.8	1.7
12..........	9 34	5 10	11 10	(7 58)	1 36	4.0	1.7
	(21 55)	17 40	23 40	8 06	(1 45)	4.0	1.8
13..........	10 17	5 50	.. ..	(7 55)	. ..	4.1	. .
	(22 39)	18 20	12 00	8 03	1 43	4.4	1.7
14..........	11 00	6 30	0 25	(7 51)	(1 46)	4.2	1.9
	(23 23)	18 50	12 30	7 50	1 30	4.5	1.7
15..........	11 45	7 00	1 00	(7 37)	(1 37)	4.1	1.7
	.. ..	19 30	13 10	7 45	1 25	4.5	1.4
16..........	(0 08)	7 40	1 40	(7 32)	(1 32)	4.0	1.6
	12 31	20 15	13 35	7 44	1 04	4.7	1.5
Half monthly sums..........................				31 220 849	31 25 1004	31 128.6	31 48.1
17..........	(0 55)	8 20	2 25	(7 25)	(1 30)	4.1	1.7
	13 19	20 45	14 20	7 26	1 01	4.8	1.4
18..........	(1 44)	9 00	3 15	(7 16)	(1 31)	4.3	1.7
	14 10	21 30	15 00	7 20	0 50	4.9	1.6
19..........	(2 36)	9 45	3 50	(7 09)	(1 14)	4.1	1.8
	15 02	22 10	15 30	7 08	0 28	4.8	1.5
20..........	(3 29)	(10 35)	4 40	(7 06)	(1 11)	(3.8)	1.8
	15 56	(23 05)	(16 20)	7 09	0 24	(4.6)	(1.5)
21..........	(4 24)	11 30	(5 40)	(7 06)	(1 16)	4.0	(1.7)
	16 52	.. ..	17 15	. ..	0 23	. .	1.7
22..........	(5 20)	0 00	6 35	7 08	(1 15)	4.7	1.8
	17 48	12 30	18 20	(7 10)	0 32	3.8	1.7
23..........	(6 15)	1 10	7 30	7 22	(1 15)	4.6	1.7
	18 43	13 25	19 40	(7 10)	0 57	3.8	1.6
24..........	(7 10)	2 00	8 25	7 17	(1 15)	4.4	1.5
	19 38	(14 25)	(20 35)	(7 15)	0 57	(4.0)	(1.5)
25..........	(8 05)	(3 00)	(9 15)	7 22	(1 10)	(4.3)	(1.4)
	20 32	(15 30)	(21 25)	(7 25)	0 53	(4.4)	(1.5)
26..........	(8 58)	(4 00)	(10 10)	7 28	(1 12)	(4.3)	(1.3)
	21 25	16 35	22 20	(7 37)	0 55	4.6	1.4
27..........	(9 52)	(5 00)	11 00	7 35	(1 08)	(4.4)	1.2
	22 18	(17 35)	23 50	(7 43)	1 32	(4.9)	1.4

FIRST REDUCTION.—Continued.

Date. Year 1904.	Moon's Transits.	Time of— High Water.	Time of— Low Water.	Lunitidal Interval. High Water.	Lunitidal Interval. Low Water.	Height of— High Water.	Height of— Low Water.
mo. d.	h. m.	h. m.	h. m.	h. m.	h. m.	feet.	feet.
Apr. 28..........	(10 45)	6 00	.. ..	7 42	. ..	4.5	..
	23 11	18 35	12 00	(7 50)	(1 15)	5.1	1.1
29..........	(11 38)	6 50	0 35	7 39	1 24	4.5	1.4
	.. ..	19 15	12 40	(7 37)	(1 02)	5.2	1.1
30..........	0 05	7 35	1 30	7 30	1 25	4.4	1.3
	(12 32)	20 10	13 35	(7 38)	(1 03)	5.2	1.1
Half monthly sums..........				27 189 633	27 18 658	27 120.5	27 40.4
May 1..........	0 59	8 25	2 00	7 26	1 01	4.2	1.3
	(13 26)	20 50	14 25	(7 24)	(0 59)	5.2	1.2
2..........	1 52	9 00	3 10	7 08	1 18	4.2	1.5
	(14 19)	(21 35)	(15 05)	(7 16)	(0 46)	(5.0)	(1.4)
3..........	2 46	10 00	(4 05)	7 14	1 19	4.1	(1.6)
	(15 12)	22 20	15 50	(7 08)	(0 38)	4.8	1.6
4..........	3 37	10 50	5 00	7 13	1 33	3.8	1.7
	(16 03)	(23 10)	17 00	(7 07)	(0 57)	(4.6)	1.7
5..........	4 27	11 35	(5 50)	7 08	1 23	3.6	(1.8)
	(16 52)	.. ..	17 40	. ..	(0 48)	..	1.9
6..........	5 15	0 00	6 35	(7 08)	1 20	4.3	1.9
	(17 39)	12 40	18 30	7 25	(0 51)	3.6	2.0
7..........	6 02	0 50	7 30	(7 11)	1 28	4.3	2.0
	(18 24)	13 45	19 45	7 43	(1 21)	3.9	2.2
8..........	6 46	1 35	8 25	(7 11)	1 39	4.2	1.9
	(19 08)	14 30	20 50	7 44	(1 42)	3.8	2.1
9..........	7 29	2 40	8 50	(7 32)	1 21	4.1	2.0
	(19 51)	15 30	21 25	8 01	(1 34)	4.0	2.1
10..........	8 12	3 40	9 40	(7 49)	1 28	4.0	1.9
	(20 34)	16 20	22 25	8 08	(1 51)	4.1	2.1
11..........	8 55	4 30	10 25	(7 56)	1 30	4.0	1.8
	(21 17)	17 00	23 10	8 05	(1 53)	4.1	1.9
12..........	9 39	5 10	11 00	(7 53)	1 21	3.9	1.6
	(22 02)	17 40	23 50	8 01	(1 48)	4.4	1.9
13..........	10 25	5 55	11 50	(7 53)	1 25	4.0	1.5
	(22 48)	18 25	.. ..	8 00	. ..	4.5	..
14..........	11 13	6 25	0 30	(7 37)	(1 42)	3.9	1.6
	(23 37)	19 00	12 20	7 47	1 07	4.8	1.4
15..........	.. ..	7 15	1 20	(7 38)	(1 43)	4.0	1.7
	12 03	19 45	12 50	7 42	0 47	5.0	1.5
16..........	(0 29)	8 00	2 00	(7 31)	(1 31)	4.1	1.7
	12 56	20 20	13 40	7 24	0 44	5.0	1.4
Half monthly sums..........				31 222 743	31 23 1058	31 131.5	31 53.9
17..........	(1 23)	8 35	2 40	(7 12)	(1 17)	4.0	1.6
	13 50	21 00	14 20	7 10	0 30	5.1	1.4
18..........	(2 18)	9 25	3 30	(7 07)	(1 12)	4.0	1.6
	14 47	22 00	15 00	7 13	0 13	5.0	1.4
19..........	(3 15)	10 20	4 25	(7 05)	(1 10)	4.0	1.6
	15 43	22 40	16 10	6 57	0 27	4.9	1.5
20..........	(4 12)	11 00	5 20	(6 48)	(1 08)	4.0	1.6
	16 39	23 50	17 30	7 11	0 51	4.8	1.6

FIRST REDUCTION.—Continued.

Date. Year 1904.	Moon's Transits.	Time of— High Water.	Time of— Low Water.	Lunitidal Interval. High Water.	Lunitidal Interval. Low Water.	Height of— High Water.	Height of— Low Water.
mo. d.	h. m.	h. m.	h. m.	h. m.	h. m.	feet.	feet.
May 21..........	(5 07)	12 00	6 00	(6 53)	(0 53)	4.2	1.6
	17 34	.. ..	18 20	. ..	0 46	. .	1.9
22..........	(6 01)	0 30	7 00	6 56	(0 59)	4.8	1.8
	18 28	13 30	19 20	(7 29)	0 52	4.3	1.9
23..........	(6 54)	2 00	8 20	7 32	(1 26)	4.6	1.5
	19 20	14 30	20 40	(7 36)	1 20	4.4	1.7
24..........	(7 46)	2 40	9 00	7 20	(1 14)	4.4	1.4
	20 12	15 45	21 45	(7 59)	1 33	4.6	1.7
25..........	(8 37)	4 00	10 00	7 48	(1 23)	4.3	1.3
	21 03	16 30	23 00	(7 53)	1 57	4.7	1.7
26..........	(9 29)	5 00	11 00	7 57	(1 31)	4.2	1.3
	21 55	17 30	23 50	(8 01)	1 55	5.0	1.7
27..........	(10 21)	5 35	11 40	7 40	(1 19)	4.3	1.4
	22 48	18 00	.. ..	(7 39)	. ..	5.0	. .
28..........	(11 14)	6 30	0 35	7 42	1 47	4.2	1.5
	23 41	19 00	12 30	(7 46)	(1 16)	5.1	1.3
29..........	.. ..	7 20	1 30	7 39	1 49	4.2	1.6
	(12 07)	19 50	13 20	(7 43)	(1 13)	5.1	1.3
30..........	0 34	8 00	2 25	7 26	1 51	4.1	1.6
	(13 00)	20 25	14 00	(7 25)	(1 00)	5.1	1.5
31..........	1 26	9 00	3 00	7 34	1 34	4.1	1.7
	(13 52)	21 00	14 35	(7 08)	(0 43)	5.0	1.6
Half monthly sums..........................				29 200 949	29 20 909	29 131.5	29 45.3
June 1..........	2 18	9 40	3 50	7 22	1 32	4.0	1.7
	(14 43)	22 00	15 30	(7 17)	(0 47)	4.8	1.7
2..........	3 07	10 40	4 40	7 33	1 33	3.9	1.8
	(15 31)	23 00	16 35	(7 29)	(1 04)	4.5	1.8
3..........	3 55	11 25	5 35	7 30	1 40	3.9	1.9
	(16 18)	23 20	17 10	(7 02)	(0 52)	4.4	1.9
4..........	4 40	12 00	6 20	7 20	1 40	3.9	1.9
	(17 03)	.. ..	18 00	. ..	(0 57)	. .	2.1
5..........	5 24	0 20	6 50	(7 17)	1 26	4.3	1.9
	(17 46)	12 35	19 00	7 11	(1 14)	3.8	2.2
6..........	6 07	1 15	7 25	(7 29)	1 18	4.1	1.9
	(18 29)	14 00	20 00	7 53	(1 31)	4.0	2.2
7..........	6 50	2 00	8 30	(7 31)	1 40	4.1	2.0
	(19 12)	14 30	21 00	7 40	(1 48)	4.1	2.2
8..........	7 33	2 35	9 00	(7 23)	1 27	3.9	1.8
	(19 55)	15 20	21 30	7 47	(1 35)	4.2	2.2
9..........	8 18	3 15	9 35	(7 20)	1 17	3.9	1.9
	(20 40)	16 15	22 30	7 57	(1 50)	4.5	2.2
10..........	9 04	4 15	10 30	(7 35)	1 26	4.0	1.8
	(21 28)	17 00	23 20	7 56	(1 52)	4.7	2.1
11..........	9 53	5 00	11 15	(7 32)	1 22	4.1	1.8
	(22 18)	17 25	23 55	7 32	(1 37)	5.1	2.1
12..........	10 45	5 35	11 40	(7 17)	0 55	4.2	1.8
	(23 12)	18 15	.. ..	7 30	. ..	5.2	. .
13..........	11 40	6 25	0 25	(7 13)	(1 13)	4.3	2.0
	.. ..	19 20	12 30	7 40	0 50	5.3	1.7

FIRST REDUCTION.—Continued.

Date. Year 1904.	Moon's Transits.	Time of— High Water.	Time of— Low Water.	Lunitidal Interval. High Water.	Lunitidal Interval. Low Water.	Height of— High Water.	Height of— Low Water.
mo. d.	h. m.	h. m.	h. m.	h. m.	h. m.	feet.	feet.
June 14..........	(0 08)	7 35	1 30	(7 27)	(1 22)	4.4	1.9
	12 36	20 10	14 00	7 34	1 24	5.4	1.6
15..........	(1 06)	8 40	2 30	(7 34)	(1 24)	4.4	1.8
	13 35	21 00	14 25	7 25	0 50	5.2	1.5
16..........	(2 04)	10 00	3 30	(7 56)	(1 26)	4.3	1.6
	14 33	22 15	16 00	7 42	1 27	5.2	1.5
Half monthly sums..........................				31 217 954	31 25 1039	31 136.1	31 58.5
17..........	(3 01)	10 20	5 00	(7 19)	(1 59)	4.3	1.5
	15 29	22 40	16 35	7 11	1 06	5.0	1.5
18..........	(3 57)	11 00	5 00	(7 03)	(1 03)	4.3	1.5
	16 24	23 30	17 00	7 06	0 36	4.8	1.5
19..........	(4 51)	.. ..	6 00	. ..	(1 09)	. .	1.4
	17 17	12 10	18 20	(7 19)	1 03	4.3	1.6
20..........	(5 43)	0 20	7 00	7 03	(1 17)	4.5	1.4
	18 09	13 20	19 15	(7 37)	1 06	4.4	1.9
21..........	(6 35)	1 25	8 00	7 16	(1 25)	4.5	1.6
	19 00	14 15	20 20	(7 40)	1 20	4.7	2.0
22..........	(7 25)	2 30	8 35	7 30	(1 10)	4.5	1.6
	19 51	15 15	21 30	(7 50)	1 39	5.0	2.1
23..........	(8 16)	3 20	9 40	7 29	(1 24)	4.4	1.7
	20 42	16 15	22 25	(7 59)	1 43	5.0	2.0
24	(9 08)	4 30	10 30	7 48	(1 22)	4.2	1.5
	21 34	17 15	23 30	(8 07)	1 56	5.0	1.9
25..........	(10 00)	5 25	11 20	7 51	(1 20)	4.2	1.5
	22 26	18 00	.. ..	(8 00)	. ..	5.0	. .
26..........	(10 52)	6 10	0 15	7 44	1 49	4.1	1.9
	23 18	18 50	12 10	(7 58)	(1 18)	5.1	1.5
27..........	(11 44)	7 10	1 00	7 52	1 42	4.1	1.9
	.. ..	19 30	12 50	(7 46)	(1 06)	5.1	1.6
28..........	0 10	7 45	2 00	7 35	1 50	4.2	2.0
	(12 35)	20 15	13 35	(7 40)	(1 00)	5.1	1.8
29..........	1 00	8 25	2 40	7 25	1 40	4.2	2.0
	(13 24)	21 00	14 20	(7 36)	(0 56)	5.0	1.9
30..........	1 48	9 10	3 20	7 22	1 32	4.2	2.0
	(14 12)	21 30	15 10	(7 18)	(0 58)	4.9	2.0
Half monthly sums..........................				27 191 804	27 24 749	27 124.1	27 46.8

RECAPITULATION.

Lat. 25°05′ N. Long. 77°21′ W.

NOTE.—Half monthly sums.

1903-1904.	No. of Obs. H. W.	No. of Obs. L. W.	Lunitidal Interval. High Water.		Low Water.		Mean. H. W.	Mean. L. W.
1903.			h.	m.	h.	m.	feet.	feet.
July 1-16.........	30	31	217	800	29	916	129.3	58.7
17-31.........	29	29	203	981	27	673	136.8	49.3
Aug. 1-16.........	31	31	227	864	35	909	135.9	62.3
17-31.........	29	29	202	668	19	909	138.5	50.8

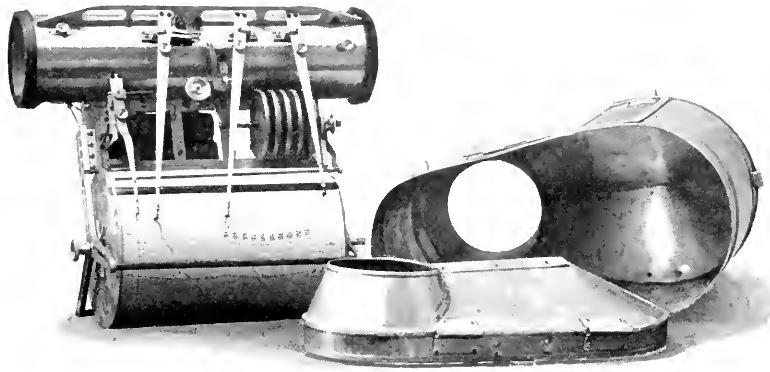

FIG. 1.—MARVIN METEOROGRAPH, PUBLISHED BY COURTESY OF MARYLAND WEATHER SERVICE

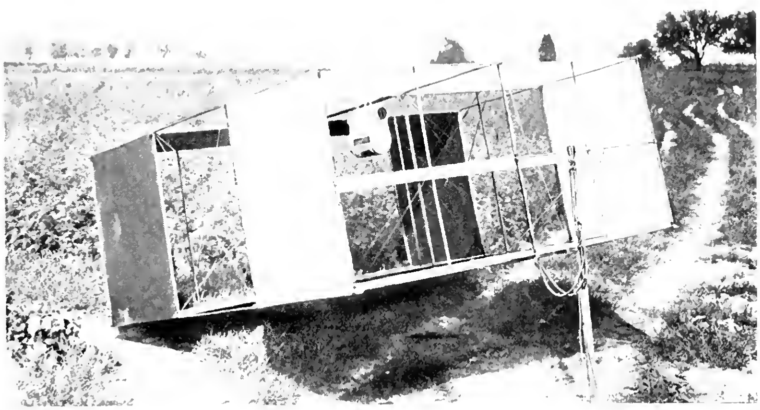

FIG. 2.—KITE AND MARVIN METEOROGRAPH, PUBLISHED BY COURTESY OF MARYLAND WEATHER SERVICE

VIEWS OF PHYSICAL APPARATUS

RECAPITULATION.—Continued.

1903–1904.	No. of Obs. H. W.	No. of Obs. L. W.	Lunitidal Interval. High Water. h.	High Water. m.	Low Water. h.	Low Water. m.	Mean. H. W. feet.	Mean. L. W. feet.
1903.								
Sept. 1-16.........	31	31	226	908	35	825	145.2	67.4
17-30.........	27	27	190	851	26	702	128.1	50.6
Oct. 1-16.........	31	31	221	896	32	855	145.4	65.1
17-31.........	29	29	204	961	28	830	130.4	54.5
Nov. 1-16.........	31	31	221	808	28	950	136.1	49.1
17-30.........	27	27	191	926	24	987	114.5	50.1
Dec. 1-16.........	31	30	222	808	30	993	135.0	41.2
17-31.........	29	30	206	896	30	930	113.4	45.9
1904.								
Jan. 1-16.........	31	30	223	763	33	791	130.1	37.1
17-31.........	29	29	200	905	25	730	113.6	41.8
Feb. 1-16.........	31	31	224	778	29	943	125.8	35.8
17-29.........	25	25	173	647	14	807	98.5	35.4
Mar. 1-16.........	31	31	225	703	31	693	132.6	44.3
17-31.........	29	29	200	753	21	688	124.6	42.7
Apr. 1-16.........	31	31	220	849	25	1004	128.6	48.1
17-30.........	27	27	189	633	18	658	120.5	40.4
May 1-16.........	31	31	222	743	23	1058	131.5	53.9
17-31.........	29	29	200	949	20	909	131.5	45.3
June 1-16.........	31	31	217	954	25	1039	136.1	58.5
17-30.........	27	27	191	804	24	749	124.1	46.8
	707	707	5014	19848	631	20548	3086.1	1175.1
Mean			7	33.6	1	22.6	4.37	1.66
Correction				—10.8		—10.8		
Corrected Intervals			7	22.8	1	11.8		

4.37 — 1.66 = 2.71 = uncorrected mean range.

The mean range of tide, as given by the direct summation of high and low waters, usually requires to be corrected for the longitude of the moon's ascending node, there being whole series of years during which the mean annual range is greater than an average for the lunar cycle, followed by another series of years having a smaller mean annual range than the average. For the series at Nassau the longitude of the moon's node is $N = 181°.8$ for the middle of the series, which gives $I = 18°.3$ for the inclination of the lunar orbit to the terrestrial equator. The corrected mean range is equal to the product of the observed mean range by the factor $F(Mn)$ obtained from Table 14, of Appendix 7, Coast and Geodetic Survey Report for 1894. This gives, putting Mn for the corrected mean range,

$$Mn = 2.71 \times 0.972 = 2.634 \text{ ft.}$$

Another determination of the corrected mean range is given after the table of harmonic constants, where various other ranges, such as spring and neap range, etc., will be found.

The harmonic constants given below were obtained from the hourly heights of the sea at Nassau, for the year beginning July 1, 1903, by a process essentially similar to that outlined by Professor George H. Darwin, in the report of the British Association for the Advancement of Science, for the year 1883. The amplitudes (H) or semiranges of the components, and their epochs (κ) or component-tidal intervals expressed in degrees, as given in the table, have been corrected by a process for eliminating the small residual effect of one component upon another.

HARMONIC CONSTANTS.

From one year of hourly heights beginning July 1, 1903.

Symbol.	Name of Component.	Speed per solar hour.	Amplitude. H	Epoch. κ
		°	Feet.	°
J_1	Smaller lunar elliptic diurnal	15.5854433	0.0169	118.73
K_1	Luni-solar diurnal	15.0410686	0.2848	120.50
K_2	Luni-solar semidiurnal	30.0821372	0.0654	246.10
L_2	Smaller lunar elliptic semidiurnal	29.5284788	0.0459	246.59
M_1	Smaller lunar elliptic diurnal	14.4920521	0.0144	101.97
M_2	Principal lunar series	28.9841042	1.2422	213.38
M_3	" " "	43.4761563	0.0067	153.73
M_4	" " "	57.9682084	0.0171	65.31
M_6	" " "	86.9523126	0.0059	279.15
N_2	Larger lunar elliptic semidiurnal	28.4397296	0.3026	190.54
$2N$	Lunar elliptic semidiurnal, second order	27.8953548	0.0402	167.70
O_1	Lunar diurnal	13.9430356	0.2138	124.06
OO	Lunar diurnal, second order	16.1391016	0.0092	116.94
P_1	Solar diurnal	14.9589314	0.0872	121.59
Q_1	Larger lunar elliptic diurnal	13.3986609	0.0377	118.28
$2Q$	Lunar elliptic diurnal, second order	12.8542862	0.0056	127.59
R_2	Smaller solar elliptic	30.0410686	0.0017	237.36
S_1	Principal solar series	15.0000000	0.0104	171.96
S_2	" " "	90.0000000	0.0034	104.04
S_4	" " "	60.0000000	0.0044	318.81
S_6	" " "	30.0000000	0.2101	237.36
T_2	Larger solar elliptic	29.9589314	0.0124	237.36
λ_2	Smaller lunar evectional	29.4556254	0.0087	224.51
μ_2	Variational	27.9682084	0.0282	202.73
ν_2	Larger lunar evectional	28.5125830	0.0675	189.28
ρ_1	Larger lunar evectional diurnal	13.4715144	0.0081	125.59
Sa	Solar annual	0.0410686	0.3115	143.90
Ssa	Solar semidiurnal	0.0821372	0.1013	32.88

The mean lunitidal intervals may be obtained from the harmonic constants by the equations

$$HWI = 0.0345 \ (M_2^0 - v) \tag{1}$$

$$LWI = 0.0345 \ (M_2^0 - w) + 6.21\text{h}. \tag{2}$$

where HWI = mean high water lunitidal interval
" LWI = " low " "

and v and w are such that

$$\tan v = \frac{2M_4 \sin (2M_2^0 - M_4^0) + 3M_6 \sin (3M_2^0 - M_6^0) + \ldots .}{1^2 M_2 + 2^2 M_4 \cos (2M_2^0 - M_4^0) + 3^2 M_6 \cos (3M_2^0 - M_6^0) + \ldots .}$$

$$\tan w = \frac{2M_4 \sin (2M_2^0 - M_4^0) - 3M_6 \sin (3M_2^0 - M_6^0) + \ldots .}{-1^2 M_2 + 2^2 M_4 \cos (2M_2^0 - M_4^0) - 3^2 M_6 \cos (3M_2^0 - M_6^0) + \ldots .}$$

From (1) and (2) we obtain

$HWI =$ 7h. 21.5m. $LWI =$ 1h. 09.4m.

The corresponding values from the First Reduction were

$HWI =$ 7h. 22.8m. $LWI =$ 1h. 11.8m.

which, considering the great difference in methods, is regarded as a very fair agreement.

The sun's effect upon the time of tide is sometimes to accelerate and sometimes to retard its occurrence, according to the moon's phase or the relative positions of the moon and sun. The *priming* of the tides is the period when the tides occur sooner than the average, which roughly speaking usually occurs from new or full moon to the quadratures; and the *lagging* of the tides is the period during which they occur later than the average, which is approximately from the quadratures to new or full moon. The theoretical limits of this variation in lunitidal interval due to priming and lagging of the tide are given by the following formulas:

$$\text{Mean minimum } HWI = HWI - \frac{127\ S_2}{M_2} \tag{3}$$

$$\text{“ maximum } HWI = HWI + \frac{127\ S_2}{M_2} \tag{4}$$

$$\text{Extreme minimum } HWI = HWI - \frac{139.7\ S_2}{M_2 - 77 N_2} \tag{5}$$

$$\text{“ maximum } HWI = HWI + \frac{139.7\ S_2}{M_2 - 77 N_2}. \tag{6}$$

For Nassau we obtain from (3), (4), (5), and (6), the following values:

Least lunitidal intervals due to phase or priming of the tides.

Mean Minimum	Extreme minimum
$HWI =$ 7h. 01.3m.	$HWI =$ 6h. 53.6m.

Greatest lunitidal intervals due to phase or lagging of the tides.

Mean maximum	Extreme maximum
$HWI =$ 7h. 44.3m.	$HWI =$ 7h. 52.0m.

The extreme values for priming and lagging occur when the moon is in apogee at the time of the equinoxes, and the moon is between three and four days from the new or full.

The declination of the moon also makes a change in the lunitidal intervals and heights of the tide, which is usually greatest when the declination becomes a maximum, at which time the moon is not far from the tropics. Hence the tides due to the moon's declination, when at their most pronounced type, are called *tropic tides.* At the time of the tropic tides the two high or two low waters of the same day are generally unequal, and the range from the higher high water to the lower low water is called the great tropic range.

The lunitidal intervals for the tropic higher high and lower high waters and for the higher low and lower low waters may be obtained from the mean intervals as follows:

$$\text{Tropic } HHWI = HWI - 2.07 \times \text{Table } 44 \tag{7}$$
$$\text{" } LHWI = HHI - 2.07 \times \text{" } 44 \tag{8}$$
$$\text{" } HLWI = LWI - 2.07 \times \text{" } 44 \tag{9}$$
$$\text{" } LLWI = LWI - 2.07 \times \text{" } 44. \tag{10}$$

The table referred to here is in Appendix 9, Coast and Geodetic Survey Report for 1897, the argument being different for each phase of tide. The tropic lunitidal intervals from (7), (8), (9), and (10), are:

Tropic $HHWI = 7^h\ 27.7^m a$ Tropic $HLWI = 1^h\ 34.2^m$
" $LHWI = 7^h\ 14.0^m$ " $LLWI = 0^h\ 46.0^m a.$

A tropic lunitidal interval marked a indicates that if such an interval is added to the time of an upper transit of the moon when in north declination, or to a lower transit with south declination, it will give the time of the higher high or lower low water, according to which interval is used.

The tropic tides may be said to result from the combination of a semidiurnal with a diurnal wave. The tropic lunitidal interval of the diurnal wave, putting D_1 for diurnal, may be found by the equation

$$D_1HWI = 0.0342\,(K_1^0 + O_1^0)a \tag{11}$$

which gives

$$D_1HWI = 8^h\ 21.9^m a.$$

The mean range of tide may be obtained from the harmonic constants by the formula

$$\begin{aligned} Mn = 2M_2 &+ \frac{1}{2M_2 m_2^2}\Big[S_2^2 s_2^2 + N_2^2 n_2^2 + \ldots . + K_1^2 k_1^2 + O_1^2 o_1^2 + \ldots .\Big] \\ &+ M_2(\cos v + \cos w) + \frac{\pi}{180}\,2M_4\,(v - w)\sin(2M_2^0 - M_4^0) \\ &+ 2M_6\cos(3M_2^0 - M_6^0) - 2M_2 \end{aligned}$$

which, by means of Table 22, Appendix 7, Coast and Geodetic Survey Report for 1894, becomes

$$Mn = 2.04\ M_2 \times \text{Table } 22 + .035\ M_4\ (v - w) \sin\ (2M_2^0 - M_4^0)$$
$$+ M_2 (\cos v + \cos w) + 2M_6 \cos\ (3M_2^0 - M_6^0) - 2M_2 \qquad (12)$$

in which the v and w are the same as obtained for (1) and (2). By (12) the mean range of tide at Nassau from the harmonic constants is

$$Mn = 2.609 \text{ ft.}$$

and from the high and low waters this range was found to be

$$Mn = 2.634 \text{ ft.}$$

The spring and neap ranges of tide may be obtained from the harmonic constants by the formulas

$$Sg = Mn - .536\ \frac{S_2^2}{M_2} + \left[1.96 - .08\left(\frac{K_1 + O_1}{M_2}\right)^2\right]$$
$$\times [S_2 + \mu_2 \cos\ (2M_2^0 - S_2^0 - \mu_2^0)] \qquad (13)$$

$$Np = Mn - .536\ \frac{S_2^2}{M_2} - \left[1.96 - .08\left(\frac{K_1 + O_1}{M_2}\right)^2\right]$$
$$\times [S_2 + \mu_2 \cos\ (2M_2^0 - S_2^0 - \mu_2^0)] \qquad (14)$$

in which the first and last letters of the words spring and neap are used as abbreviations.

From (13) and (14) we obtain

$$Sg = 3.051 \text{ ft., and } Np = 2.129 \text{ ft.}$$

The heights of the tropic tides may be found by the following formulas:

Tropic HHW =	$1.02\ \Delta_2 \times$	Table 45,	above	MSL		(15)
" LHW =	"	"	"	"		(16)
" HLW =	"	"	"	"		(17)
" LLW =	"	"	"	"		(18)

where $\Delta_2 = 1.010\ M_2 + 0.27\ \dfrac{S_2^2}{M_2^2} - K_2 \cos\ [(K_1^0 - O_1^0) \sim (K_2^0 - M_2^0)]$,

and the table is in Appendix 9 of the Coast and Geodetic Survey Report for 1897, different arguments being used for entering the table for the various tides. From (15), (16), (17), and (18), we find

Tropic HHW = 1.737 ft.	above	mean	sea	level.
" LHW = 0.735 "	"	"	"	"
" HLW = 1.124 "	below	"	"	"
" LLW = 1.404 "	"	"	"	"

The difference between the two high waters of the tropic tides is called the tropic high water diurnal inequality, abbreviated to Tropic HWQ, and the

corresponding difference for low water is called tropic low water diurnal inequality, abbreviated to Tropic LWQ. The great tropic range is the difference between higher high and lower low waters, the contraction being Gc.

$$\text{Tropic } HWQ = 1.737 - 0.735 = 1.002 \text{ ft.}$$
$$\text{“} \quad LWQ = 1.404 - 1.124 = 0.280 \text{ “}$$
$$\text{“} \quad Gc = 1.737 + 1.404 = 3.141 \text{ “}$$

The mean great diurnal range of tide is abbreviated Gt, and when either tropic inequality is more than a quarter of Mn, we have

$$Gt = \frac{3Gc + Mn}{4} = 3.008 \text{ ft.}$$

The range of the diurnal wave may be found from the harmonic constants by the formula

$$2D_1 = 2.042\ (K_1 + O_1) \tag{19}$$

in which the diurnal wave is represented by $2D_1$. From (19) we obtain

$$2D_1 = 1.018 \text{ ft. for Nassau.}$$

The *perigean* and *apogean* ranges are due to the moon's varying distance, and may be obtained from the harmonic constants by the following formulas:

$$Pn = Mn - \frac{.481\ N_2^2}{M_2} + \left[2.1 - \frac{S_2^2\, s_2^2}{2\, M_2^2\, m_2^2} - \frac{.08\ (K_1 + O_1)^2}{M_2^2}\right] \times [2N + N_2 - L_2] \tag{20}$$

$$An = Mn - \frac{.481\ N_2^2}{M_2} + \left[2.1 - \frac{S_2^2\, s_2^2}{2\, M_2^2\, m_2^2} - \frac{.08\ (K_1 + O_1)^2}{M_2^2}\right] \times [2N - (N_2 - L_2)] \tag{21}$$

in which the words apogean and perigean are abbreviated to their first and last letters. From (20) and (21) we find for Nassau

$$Pn = 3.190 \text{ ft., and } An = 2.124 \text{ ft.}$$

Recapitulation.

Non-harmonic results for Nassau, New Providence, Bahamas, from a year of tidal observations beginning July 1, 1903.

Time Relations.

	h.	m.
Establishment of the port, or the mean high water lunitidal interval at full and change of the moon	7	28.7
Corrected establishment of the port, or the mean of all high water lunitidal intervals	7	22.8
Mean of all low water lunitidal intervals	1	11.8
“ tropic higher high water lunitidal interval	7	27.7a
“ “ lower “ “ “ “	7	14.0
“ “ higher low “ “ “	1	34.2
“ “ lower “ “ “ “	0	46.0a
“ “ high water lunitidal interval of the diurnal wave	8	21.9a
“ minimum high water lunitidal interval due to phase, or the priming of the tides	7	01.3
“ maximum “ “ “ “ “ “ “ lagging “ “	7	44.3
Extreme minimum high water lunitidal interval due to phase and parallax	6	53.6
“ maximum “ “ “ “ “ “ “ “	7	52.0

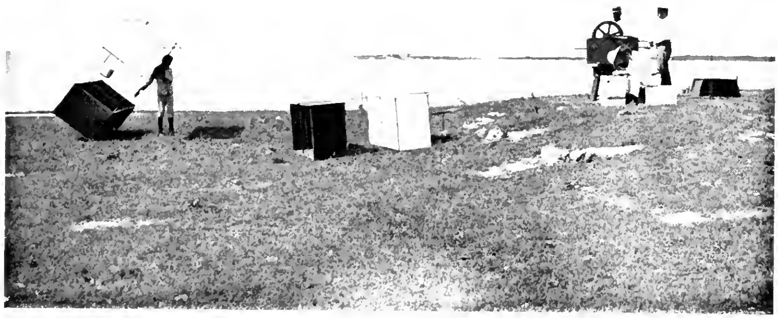

FIG. 1.—FLYING KITES AT NASSAU

FIG. 2.—VIEW OF THUNDER STORM NORTH OF ABACO

VIEWS ILLUSTRATING WORK ON CLIMATE

Height Relations.

	Ft.
Mean of all high waters on fixed tide staff	4.332
" " low " " "	1.698
" " higher high waters on fixed tide staff	4.640
" " lower low " " "	1.632
" of the tropic higher high waters on fixed tide staff	4.728
" " " lower " " " "	3.726
" " " higher low " " " "	1.867
" " " lower " " " "	1.587
" Spring high water on fixed tide staff	4.540
" " low " " "	1.489
" Neap high " " "	4.079
" " low " " "	1.950
" Perigean high " " "	4.610
" " low " " "	1.420
" Apogean high " " "	4.077
" " low " " "	1.953
" sea level from hourly heights of the sea, on fixed tide staff	2.991
" half-tide level from high and low waters, " "	3.015

Ranges, Inequalities, etc.

	Ft.
Mean range of all tides	2.634
" " Spring tides	3.051
" " Neap "	2.129
" " the great tropic tides	3.141
" " " small " "	1.859
" " tides from mean higher high to mean lower low waters	3.008
" " Perigean tides	3.190
" " Apogean "	2.124
" " the tropic diurnal wave	1.018
" tropic high water diurnal inequality	1.002
" " low " " "	0.280
" age of the phase tides	1d 0h
" " " parallax tides	1d 18h
" " " diurnal "	−0d 3h

ANNUAL VARIATION IN MEAN SEA LEVEL AT NASSAU.

Date.	Sea level feet.	Date.	Sea level feet.	Date.	Sea level feet.	Date	Sea level feet.
Jan. 1	−.3	Apr. 1	−.1	July 1	+.1	Oct. 1	+.3
" 16	−.4	" 16	−.1	" 16	+.2	" 16	+.2
Feb. 1	−.4	May 1	0	Aug. 1	+.2	Nov. 1	+.1
" 16	−.3	" 16	0	" 16	+.3	" 16	0
Mar. 1	−.3	June 1	+.1	Sept. 1	+.3	Dec. 1	−.1
" 16	−.2	" 16	+.1	" 16	+.4	" 16	−.2

The above table was computed from the formula

$$x = Sa \cos (h - Sa^0) + Ssa \cos (2h - Ssa^0)$$

where $x =$ height of mean sea level, + when above, — when below the mean of entire year.

$$h = \text{the mean longitude of the sun.}$$

The other symbols are the harmonic constants for the annual and semiannual inequalities. The values in the table do not exactly average zero, on account of fractions neglected in reducing to a single decimal place.

From this table it appears that the mean level of the sea is most depressed in the latter part of January, and most elevated in September. This change in mean level is presumed to be due to meteorological conditions, such as variations in barometric pressure and resultant wind directions and velocities.

In conclusion, it may be remarked that the type of tide at Nassau is that of the Atlantic coast of the United States, and not at all like the tides in the Gulf of Mexico.

MAGNETIC OBSERVATIONS IN THE BAHAMA ISLANDS

MAGNETIC OBSERVATIONS IN THE BAHAMA ISLANDS

BY

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INTRODUCTION.

The instrumental equipment for the magnetic survey of the Islands consisted of the following: (1) A Fauth theodolite, with a compass needle and a tripod, the latter provided with an extra head for mounting the dip circle. With this instrument observations for obtaining the true azimuth of the mark, the correction of the observer's watch on local mean time, and for latitude, were made. By mounting the compass needle on the telescope, the necessary observations were made for obtaining the magnetic declination. (2) A Kew-Casella dip circle (Plate XIV, Fig. 1), provided with two Dover needles, with which the regular dip observations were made, and two intensity needles for dip and relative intensity observations. This instrument was also provided with a compass for making declination observations. (3) A magnetic observing tent.

The entire instrumental outfit, the necessary training of observer, as well as detailed instructions for making observations of magnetic declination, dip and relative intensity and for the necessary astronomical observations, were provided by the Superintendent of the U. S. Coast and Geodetic Survey. The directions furnished were carefully and conscientiously followed at all stations occupied, and the observations were reduced in the Division of Terrestrial Magnetism of the U. S. Coast and Geodetic Survey.

STATIONS OCCUPIED.

The magnetic declination and dip have been determined for a number of localities in the Islands since 1831. The location of the stations, the values obtained and the names of the observers are given in Table 1. Some of the former stations were reoccupied, as nearly as practicable, in order to obtain the value for the secular variation in the Islands.

A complete set of observations was made at the following stations for

determining the magnetic declination, dip and relative intensity: At Nassau, on the grounds of the old Government House; at Watlings Island, the supposed landing place of Columbus in 1492; and at Clarence Town, Long Island. Observations for the determination of declination only were made on Hog Island, just across the harbor from Nassau, and very close to the former station occupied in 1879 by Lieut. Ackley; in the Public Square at Nassau, where a meridian line was utilized, which was established by Mr. Miller, the Surveyor-General of the Islands. At Hopetown, Abaco Island, declination and dip observations were made.

The results of the observations described above, and reduced under the direction of the Superintendent of the Coast and Geodetic Survey, are shown in Tables II and III. A detailed description of the stations occupied, and of the preliminary results obtained, follows in the chronological order of occupancy.[1]

Nassau: Old Government House.

The station is on the grounds of the old Government House, built by the first governor of the Islands. The property was for many years, until recently, used as a government hospital. About six or eight years ago it was purchased by the Catholic Church and the building is now the residence of the local priest.

The exact locality of the station is marked by means of five copper nails, driven into the bed rock, about 75 feet west-northwest from the northwest corner of the building. These nails are covered by means of a slab about one foot square, with the inscription "Bahama Expedition, 1903." The location of the station was further fixed by sighting upon three points, Hog Island Lighthouse to the north, the Obelisk to the west, and the northwest edge of the Priory.

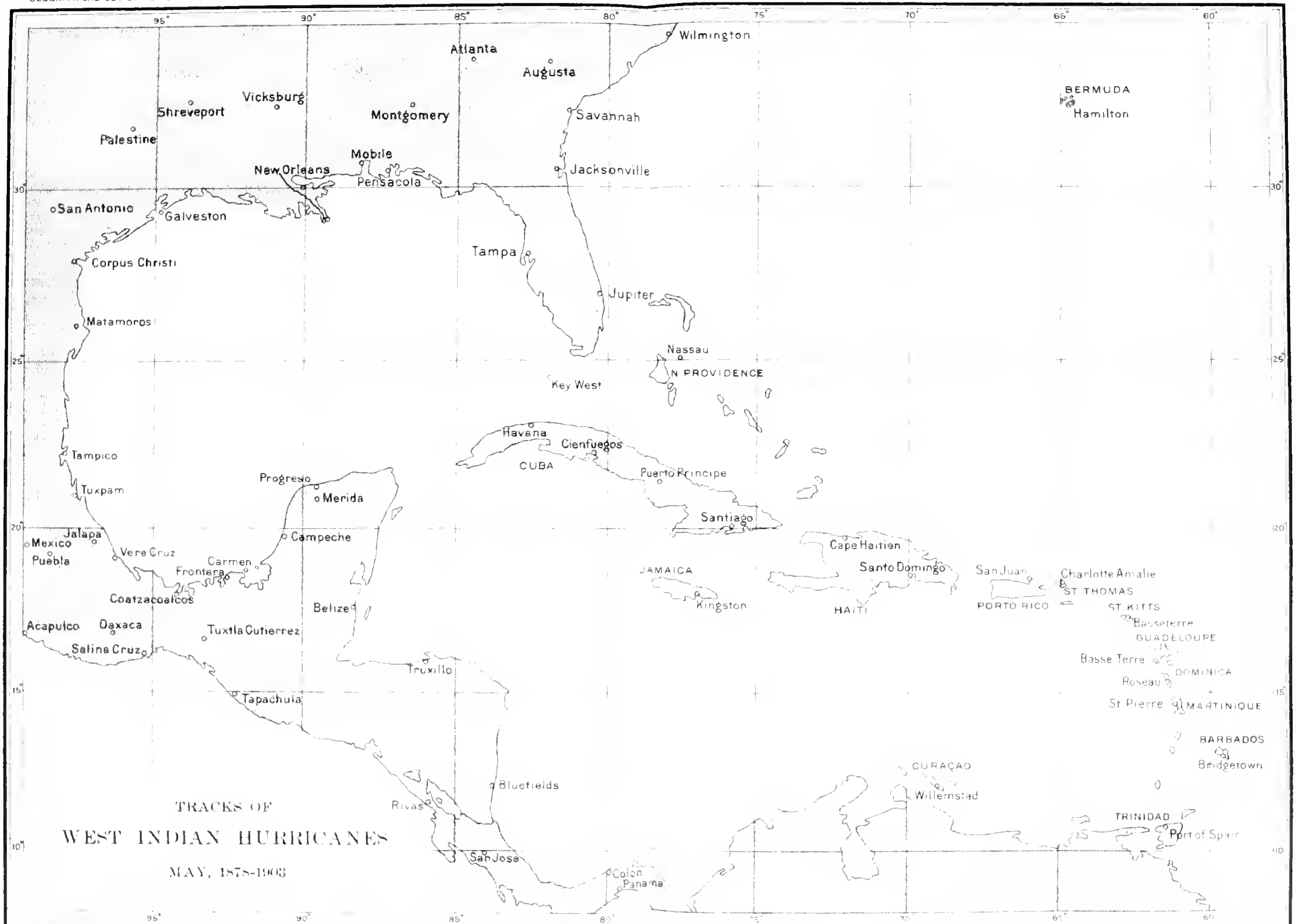
The mark used was the tip of the Obelisk at Fort Charlotte. Its true azimuth was found to be 86° 47.4′ west of true north.

Complete observations were made at this point on June 30, 1903, and July 2, 3, 4, by the writer, and recorded by J. E. Routh.

Hog Island, on the North Side of the Harbor of Nassau.

Observations to determine the magnetic declination were made about 30 to 35 feet west-northwest of the stone monument marking the southwest

[1] The descriptions of stations occupied, and the final results of the computations as given in Table II, are published in the Annual Report of the Superintendent of the U. S. Coast and Geodetic Survey for the year 1903-4, Appendix No. 3, p. 254.



TRACKS OF
WEST INDIAN HURRICANES
MAY, 1878-1903

corner of a former Crown Reservation. This is presumably within a few feet of the station occupied by Lieut. Ackley in 1879 for declination observations, although no evidence of his station was found.

The station is approximately 2200 feet from the front of the Board of Trade yard in Nassau, and 5000 feet east of the Hog Island Lighthouse. It is just above high tide, on the south shore of Hog Island, and directly opposite the Royal Victoria Hotel in Nassau.

The mark used was the Obelisk at Fort Charlotte, which is west-southwest from the station.

The observations were made July 5, 1903, by J. E. Routh, and recorded by the writer.

Nassau: Public Square.

The station is at the southern extremity of the meridian line established by the Surveyor-General, Mr. Miller, from North Star observations. This point is marked by a bolt in a stone slab a few feet to the north of the abandoned well, between the Library building and the Customs House. The north end of the meridian line is a bolt in the wall of the Customs House, about 300 feet distant from the south end, where observations for magnetic declination were made.

This meridian line is in the grounds of the public buildings. Declination observations only were made at this station, along the meridian line above described. The location, in the midst of the city buildings, was not regarded as a favorable location for magnetic observations.

The observations were made July 4, 1903, by the writer, and recorded by J. E. Routh.

Watlings Island, Cockburn Town.

The station is on the Government Residency, and hence on Crown Land. It is about 40 feet east-southeast from the southeast corner of the residence and is marked by a pint bottle buried in the ground to the depth of three or four inches. The only available mark was John Macky's house in Sugar Loaf village, distant about four miles to the south and across the bay. This house is the largest of a group of three or four dwellings, visible from the magnetic station and in the settlement called Sugar Loaf.

The location of this station was selected on account of its convenient access from the point of anchorage at Riding Rock Point, the time of observation being limited to one day, July 13, 1903. The town is called Cockburn Town, a settlement with a population of 400 to 500.

Complete magnetic observations were made by the writer, and recorded by J. E. Routh.

Clarence Town, Clarence Harbor, Long Island.

The station is in the Government Residency and is marked by a three-fourth-inch copper bolt set in bed rock, between the main portion of the residence occupied by Magistrate W. L. Clear, and the flagstaff. It is about 40 feet from the flagstaff and about 60 feet from the portico of the residence. The mark used was the rod on top of the light staff on Gaspins Point. The true azimuth of this mark was found to be 28° 44.4′ east of true north.

Complete magnetic observations were made here on July 14 and 15, 1903, by the writer, and recorded by J. E. Routh.

Hopetown, Elbow Cay, Abaco.

The observations were made on a narrow ridge between Little Harbor and the southeast coast of Elbow Cay. The station is about 100 feet northeast of the public schoolhouse, and about 100 feet northwest of the Episcopal Church. It is marked by a limestone rock about a foot square, planted in the soil.

The mark used was the rod on top of the Elbow Cay Lighthouse, which is about one-half a mile north-northwest of the station.

Only declination and dip observations were made, cloudy weather and a high northeast wind rendering it impossible to make sun observations and a full series of dip and relative intensity observations.

The observations were made by the writer, July 22, 1903, and recorded by J. E. Routh.

TABLE I.—EARLIER VALUES OF MAGNETIC ELEMENTS AT STATIONS IN THE BAHAMAS.

No.	Station.	Lat.	Long. W. of Gr.	Date.	Decl'n.	Dip.	Hor. Int.	Observer.
		° ′	° ′		° ′	° ′		
1	South Bimini....	25 12	79 17.6	1879, Feb. 21, 25, 26.	2 27.9 E.	56 20.3	0.2973	Lt. S. M. Ackley.
2	Nassau, on Hog I.	25 05.5	77 20	1879, Feb. 18-22.	1 25.6 E.	55 50.5	0.2998	"
3	Nassau...........	25 05	77 21	1839	3 07 E.		....	Milne.
4	"	25 05	77 21	1841	....	56 13	....	E. Barnett.
5	"	25 05	77 21	1843	....	56 23	....	"
6	Watlings Island*.	23 57	71 25	1831	2 31 E.		....	Smith.
7	Crooked Island†..	22 07	71 24	1831	4 27 E.		....	Austin.
8	" "	22 07	71 24	1835	5 13 E.		....	Foster.
9	Crooked Island...	22 17	71 21	1837	2 34 E.		....	Milne.

*Supposed landing place of Columbus, 1492.

† Probably should be Acklins Island.

Source.

Nos. 1 and 2, U. S. C. & G. S. Report 1881, App. 9, pp. 33-63. Nos. 3 to 9, Sabine's Contrib. XIV. Phil. Trans. Roy. Soc. 1875.

TABLE II.—RESULTS OF MAGNETIC OBSERVATIONS MADE BY THE BAHAMA EXPEDITION OF THE BALTIMORE GEOGRAPHICAL SOCIETY IN 1903.

OBSERVATIONS BY OLIVER L. FASSIG: COMPUTATIONS BY THE DIVISION OF TERRESTRIAL MAGNETISM, U. S. COAST AND GEODETIC SURVEY.

Place.	Lat.	Long. E. of Gr.	Declination. Date.	Declination. Observation.	Instr.	Inclination. Date.	Inclination. Observation.	Inclination. Needle.	Total Intensity. Date.	Total Intensity. Observation.	Total Intensity. Needles.	Observer.
	° ′	° ′		° ′			° ′					
Long Island, Clarence Town.....	23 06	74 59	July 14	0 13.0 W	C 56	July 15	53 46.7	3D	July 15	0.49817	1C & 1C	O. L. Fassig.
			" 15	0 13.7 W	C 3416	" 15	47.9	4D		683	" "	" " "
			Mean	0 13.4 W			53 47.3			0.49750		
Watlings Island, Cockburn Town....	24 04	74 26	July 13	0 18.0 W	C 3416	July 13	55 01.9	3D	July 13	0.50348	" "	" " "
						" 13	04.6	4D		264	" "	" " "
						Mean	03.2			0.50306		
Nassau, Old Gov't. House...	25 05	77 22	July 2	0 20.1 E	C 3416	June 30	56 20.4 *	3D	July 3	0.51572	" "	" " "
							55 59.8 *	4D		574	" "	" " "
						July 3	56 07.7 †	1C				
						Mean	56 09.3			0.51573		
Public Square	25 05	77 21	July 4	0 13.1 E	C 3416	....	......	....	....	......	....	" " "
Hog Island.........	25 05.5	77 21	July 5	0 23.7 E ‡ ± 10.0	C 3416	....	......	....	....	......	....	J. E. Routh.
Abaco Island, Hope Town.........	26 31	76 58	July 22	...... §	C 3416	July 22	58 06.7	3D	....	......	....	O. L. Fassig.

REMARK: Only in the case of the declination results were the decimal variation corrections of sufficient amount to make it necessary to apply them.

* Polarity of needle not reversed.

† Dip as deduced from relative total intensity observations.

‡ As no azimuth observations were secured, the azimuth of mark (Obelisk at Fort Charlotte, WSW from station) was taken from the British Admiralty chart by means of the protractor, viz. 67° 11′ W. of S., the estimated uncertainty being 10′.

§ Because of cloudiness, no azimuth observations were obtained. The magnetic bearing of rod on top of Elbow Cay Light House, from magnetic station, at 8h 45m local mean time, is 34° 56′ W. of N.

TABLE III.—TABULATION OF RESULTS FOR DETERMINATION OF SECULAR VARIATION.

Place.	Lat.	Long. W. of G.	Year and Decimal.	Decl'n.	Incl'n.	Hor. Int. (C. G. S. Units.)	Observer.
	° ′	° ′		° ′	° ′		
Nassau	25 05	77 21	1839	3 07 E.	....	....	Milne.
	25 05	77 21	1841	....	56 13	....	E. Barnett.
	25 05	77 21	1843	....	56 23	....	"
	25 05.5	77 20.0	1879.18	1 25.6 E.	55 50.5	0.2998	Lt. S. M. Ackley.
	25 05.2	77 21.3	1903.51	0 18.0 E.*	56 09.3	0.2872	O. L. Fassig.
Watlings I....	23 57	74 25	1831	2 31 E.	....	....	Smith.
	Reduction to 1903 Sta.			− 2			
			1831	2 29 E.			
	24 04	74 26	1903.53	0 18.0 W.	55 03.2	0.2882	O. L. Fassig.

* Mean of three stations, giving Hog Island one-half weight.

From the above results of magnetic declination, it is found that the average secular change in the Bahama Islands, during the past six decades, has been 2.5′ per annum, west declination having been increased annually by this amount and east declination decreased by same amount.

The results of dip and intensity are too few as yet to deduce safely the secular change in these elements.

DIRECTIONS FOR THE MAGNETIC WORK OF THE BAHAMA EXPEDITION.[2]

A. Astronomical Observations.

These will consist of two sets of sun observations made preferably both in the morning and afternoon, not necessarily on the same day, however, for obtaining the true azimuth of mark or marks used in the magnetic observations and the correction on local mean time of the watch used. By securing sun observations both morning and afternoon (two sets each time), at the same station, any error that may be due to latitude used in the computation is eliminated in the mean of the a. m. and p. m. results. If this cannot be done and it is not possible to obtain the latitude from good maps, it is necessary to obtain the latitude by circum-meridian altitudes of the sun at noon. In these observations the tripod should be mounted on the tripod pegs, packed in the tent.

The azimuth observations should be made preferably between 2 and 4 hours from local noon, i. e., 8-10 a. m. and 2-4 p. m. local time, and any one set should not cover a time interval of more than 8-10 minutes. (See App. A, Mag'n Decl'n Tables 1902, and App. 8, Rep. for 1881.)

It is supposed that the observer will use his own watch for these obser-

[2] Furnished by the Superintendent of the U. S. Coast and Geodetic Survey.

vations. It is desirable, therefore, that he bestow the same care upon it as upon a chronometer, viz.: it should be wound up at a regular time each day, so that there will be no danger of its running down, should be protected from sudden temperature changes and as carefully handled as possible. It should be set to eastern (75th meridian) standard time, then the correction to the nearest fraction of a second on standard time should be obtained from the noon signals on two or three days before the departure for the Bahamas. It must not be reset again or regulated thereafter, unless of course necessary because of its accidentally running down, and it should be compared daily, preferably at some regular time, with another good watch and a record of these comparisons kept. If opportunity is afforded in the Bahamas, the correction of the watch on standard time should be obtained whenever possible. On the return of the Expedition to Baltimore the correction of the watch on standard time should again be obtained on two or three days. The record of all comparisons should accompany the observations. With the aid of the correction on standard time, the longitudes of the stations can be obtained.

B. Magnetic Declination Observations.

(These observations, as well as the other magnetic observations, should be made inside the tent and the observer should divest himself of all articles likely to have a magnetic effect and to see that no such substances are within the tent.)

1. *With compass needle belonging to Dip Circle 56/4440:* (*a*) Sight on mark with aid of peep sights, passing the eye up and down the slits to make sure that the mark has been accurately set upon, noting whether the vertical circle of dip circle is on the left or right hand of the observer and read vernier of horizontal circle and record as shown in the specimen. Mark above the reading the quadrant of the horizontal circle in which the reading occurs as indicated by the Roman numerals I, II, III, IIII scratched on the edge of the circle. (*b*) Reverse circle 180°, again point on mark and record as before. (*c*) Turn instrument until it points approximately north and south, with vertical circle east. Release needle which has been kept clamped throughout (*a*) and (*b*) and move horizontal circle gently, making final setting with tangent screw, until the north end of needle exactly cuts the zero as beheld with the small magnifying lens belonging to the dip circle and held precisely vertical over the needle so as to avoid parallax.

Before making the final setting, it is essential to slightly disturb the needle once more with a bit of steel, e. g., pocket knife brought near. In

fact a better setting will be obtained with the needle slightly in vibration and bisecting the arc. The bit of steel used must, of course, be removed to a safe distance before the final setting. Record the reading and quadrant in which it falls and note the time by the pocket watch used in the sun observations. Do similarly with the south end. Next slightly disturb needle, in same manner as before, and repeat pointings in reverse order, i. e., first south end and then north end. (*d*) Shift horizontal circle until the north end of needle instead of cutting the zero, cuts the mark 5° E. of N. and carry out the same operation as for *c*. (*e*) Shift horizontal circle until the north end of needle now cuts the 5° W. of N. mark and do as before. (*f*) Shift horizontal circle so that north end of needle again cuts the zero and do as in *c*. Record the time of ending, clamp needle and again make two pointings on the mark as at the beginning.

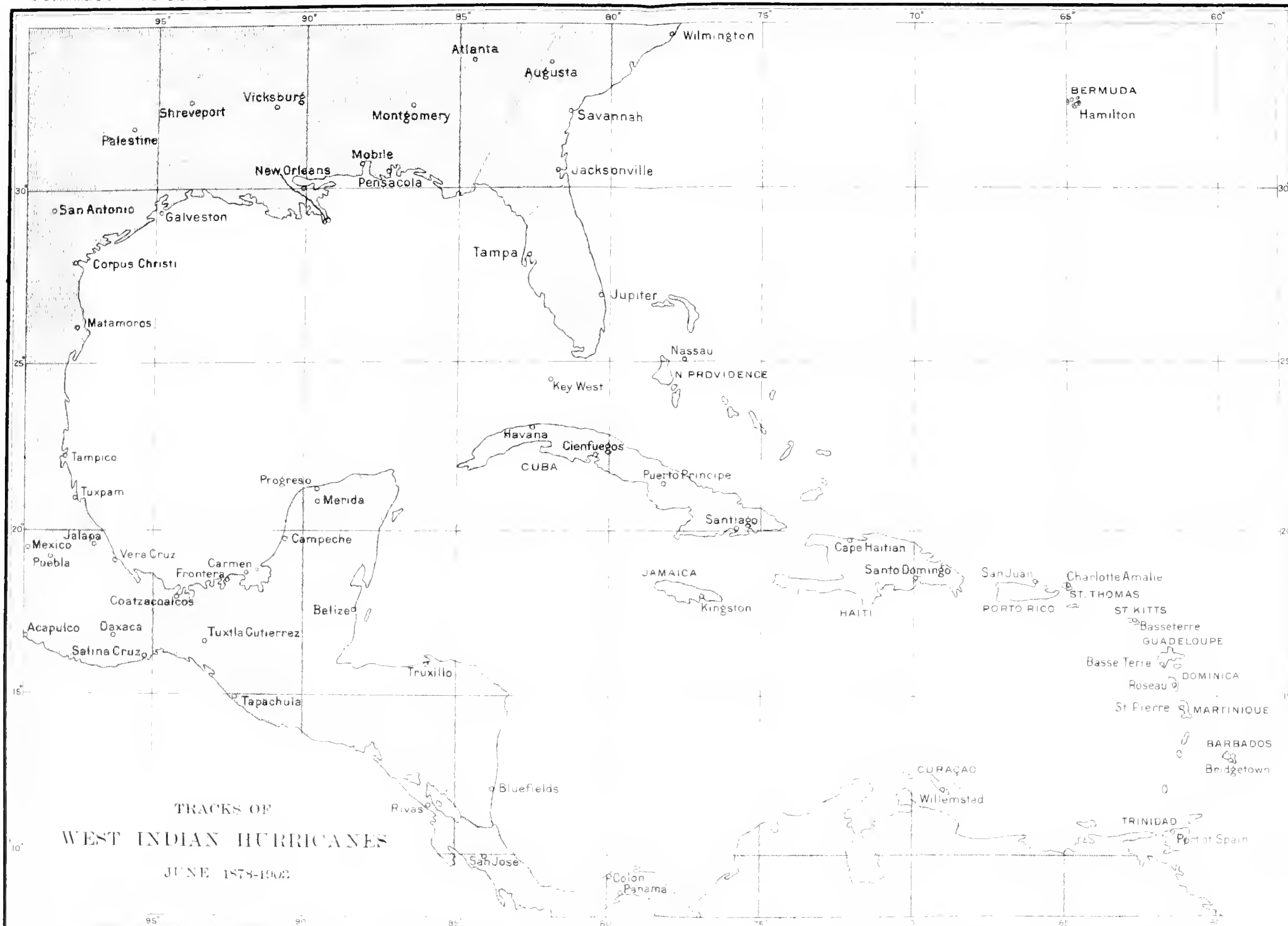
2. *With Compass Needle of Theodolite.*—The method already described can readily be adapted to this needle. The pointings on the mark in this case will be made with the telescope and, as the horizontal circle is graduated continuously from 0° to 360°, it will be unnecessary to note the quadrant in which the reading falls; however, both verniers should be read.

If the work could be so arranged that the declination would be obtained with one needle in the morning, say about 8 to 9 o'clock, and with the other needle from 1 to 2 o'clock p. m., the mean of the two results would be almost entirely free of correction due to diurnal variation of the earth's magnetism. The declination reaches its mean value between about 10 to 11 a. m. and 5 to 6 p. m., local mean time, and its extreme elongation at about the times above mentioned.

C. DIP OBSERVATIONS.

(The compass needle must be removed from instrument and tent before observations are made.)

The regular dip observations following the method already shown and as prescribed by specimen, should be made as already stated, with the Dover needles Nos. 3 and 4. These needles should invariably be reversed before making the observations and again at the conclusion of the half sets. The time to the nearest minute of beginning and ending for each needle should be recorded. The order, after the magnetic prime vertical with one needle has been determined, would be as circumstances condition: Either (*a*) Dip observations with needle 3, with say, A down, then observations with needle 4,



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likewise with A down; next reverse polarity of both needles, reversing 4 first; then dip observations with 4, B down, and finally 3, B down: or (*b*) complete dip observations with needle 3, A down, and then B down; next relative intensity observations prescribed in *D*, and finally complete observations with needle 4, A and B down.

It need not, of course, be pointed out that neither the bar magnets, nor any other magnets or needles, can be kept inside the tent during these observations nor during any of the magnetic observations. They should be kept at least 15 paces away and protected from the sun or rain with the tent cover and duck cloth provided.

D. Relative Intensity and Dip Observations.

(All observations should be made with footscrew A towards south.)

These are to be made with old needles 1 and 4 of 56 and the method is the same as already shown and prescribed by the specimens. The needles are never to have their polarities reversed. Furthermore, every care must be taken so as to avoid change of the reduction constant needed to convert the relative values obtained into absolute ones. This necessitates not bringing the needles in the vicinity of any magnets or iron masses or exposing them to sudden temperature changes, as this would alter the distribution of their magnetism and thus affect the constant. They should be placed in their box with opposite poles next each other and should not be inside the dip circle box, if the reversal of the regular dip needles is made by mounting the reversing block on top of this case. Above all, these needles, as well as the dip needles, must be wiped dry after each usage and be kept in a dry place, so as to prevent rusting of blade and especially of pivot.

The order will be as follows: Magnetic prime vertical determinations with No. 1; next (*a*) dip observations with loaded needle 4, noting time, temperature and quadrants in which the two ends of the needle swing; (*b*) No. 4, put in brass shield with face (side with A and B) of needle turned towards the vertical circle and No. 1 suspended, then dip observations, again noting time, temperature and quadrants, made with microscopes direct and reversed for position of circle E. face of No. 1 east, and for circle W. face W. (*c*) Do not touch No. 4 but turn No. 1 around on the agates, so that with circle W. face of No. 1 will now be east, observe with microscopes direct and reversed and do the same with circle E. face W. Record time and tem-

perature at end of observations. (*d*) Remove No. 1, suspend 4 and repeat observations (*a*), again recording time and temperature at end.

E. Miscellaneous Information.

Table I gives the data for stations at which some magnetic results have already been obtained. A reoccupation of as many of these as possible will furnish valuable data for determination of the secular change. Only descriptions for Nos. 1 and 2 at which observations were made by Lieut. Ackley, while attached to the Coast and Geodetic Survey, can be furnished; as he was provided with a good magnetic outfit it is especially desirable to reoccupy his stations and if possible on two or three days, as he had done.

F. General Information.

It is desirable to make duplicates of all of the observations, and after these duplicates have been carefully revised, either they or the originals should be forwarded to the Superintendent of the Coast and Geodetic Survey as soon as possible, for reduction and possibly to furnish opportunity for additional instructions before the close of the work.

Immediately upon return of the Expedition the instruments should be returned to the Superintendent of the Coast and Geodetic Survey for final determination of constants, and it would be desirable if the observer himself would take part in this final work, so as to eliminate possibility of any error such as may be ascribed to personal equation.

CLIMATE OF THE BAHAMA ISLANDS

CLIMATE OF THE BAHAMA ISLANDS

BY

OLIVER L. FASSIG, PH. D.,

Section Director of U. S. Weather Bureau, at Baltimore, Md.

INTRODUCTION.

Any critical discussion of the climate of the Bahama Islands must of necessity be based upon the record of observations contained in one of the very important publications of the London Meteorological Council. This report, published in 1890, is designated as Official Number 83, and contains very complete monthly summaries of climatic data for all of the foreign and colonial stations of the Royal Engineers and the Army Medical Department from 1852 to 1886. Here may be found a long series of extremely valuable observations made at Nassau comprising observations of air pressure, of temperature, tension of vapor, relative humidity, cloudiness, rainfall, state of weather and wind directions made at two stated periods of the day, namely, at 9 a. m. and 3 p. m. The observations were continued after 1886, probably without interruption up to the present time, but not collectively published. The facts contained in this paper regarding the general climate of the Islands are based upon this long series of observations, and especially upon the series covering the period from 1898 to 1902, made at the Bahamas Cable Office. Observations and impressions gained from personal experience refer only to the months of June and July, 1903.

During the sojourn of the Expedition in the Bahamas the writer was constantly under great obligations to Mr. P. H. Burns, Superintendent Bahamas Cable at Nassau, who took a personal interest in the work, and afforded every opportunity in securing a series of continuous observations by means of our self-recording instruments which were installed in his office.

By the courtesy of Mr. Arthur S. Haigh, a record of observations made under his supervision during four years on Cat Cay was placed at our disposal. This record comprises summaries of pressure, temperature, rainfall, humidity and the wind directions, and afforded excellent supplementary information as to conditions on one of the neighboring islands. Cat Cay is on

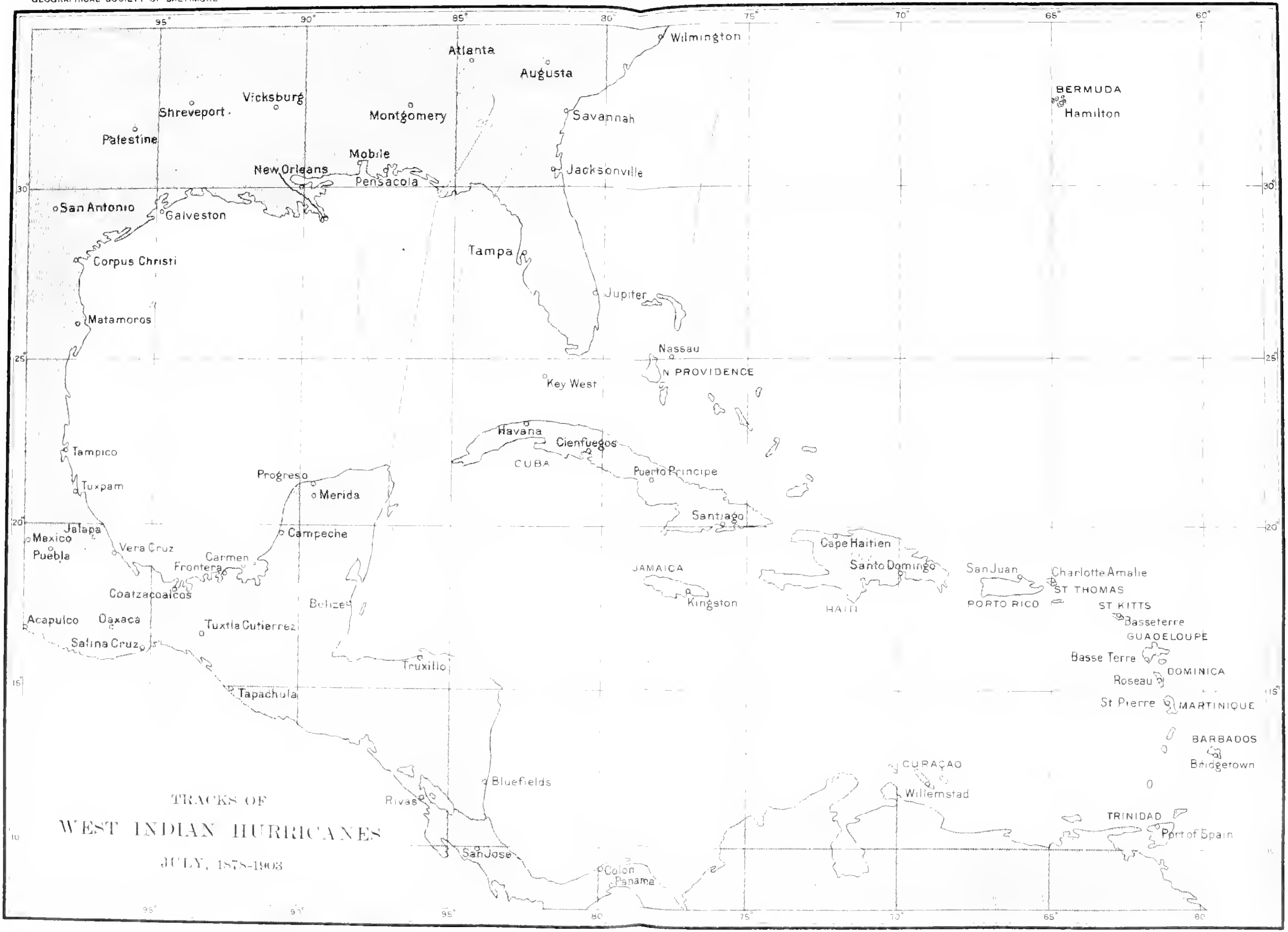
the eastern edge of the Gulf Stream opposite the southern coast of Florida and distant about 60 miles.

CLIMATE AS A WHOLE.

The geographical position of the Bahama Islands is such as to give to them many of the essential features of an ideal winter resort. The latitude of the group, from 23° to 28° north, insures a moderately high temperature throughout the year, with an average for the winter months very close to that which physicians regard as a most healthful temperature. The Islands are in the midst of the slow northward surface drift of the Atlantic waters, with the warm waters of the Gulf Stream just to the west of them, insuring at all seasons of the year an equable temperature free from marked and sudden changes from day to day, whatever the direction of the wind may be. The occasional cold northwest winds which sweep over the United States during the winter months, and constitute our cold waves, are greatly modified in temperature before reaching the coasts of our south Atlantic and Gulf States, and are still further tempered in passing over the narrow but warm waters of the Gulf Stream before striking the central or eastern islands of the group. Only rarely do these cold waves retain a vestige of their continental severity upon reaching Nassau. The temperature of the surrounding ocean waters changes but a few degrees from season to season, and as a result the Islands are practically free from the marked and rapid changes in temperature which constitute so trying a feature of the continental climates.

One of the first and most marked impressions made upon a visitor from the north to these Islands in the summer months is the intense power of the direct rays of the sun. While the increased heat of the sun was very noticeable to all of our party, the effect was not apparently harmful, nor did it cause any serious discomfort with ordinary precautions. The greatest heat of the day occurs somewhat earlier than with us. The sun's power seemed to attain a maximum as early as ten or eleven in the morning, although this is only an impression and was not verified by instrumental observations.

With an average humidity quite as high as that of the Atlantic Coast States, there was even in mid-summer less of the intensely oppressive weather so common during the warm months in the States bordering the Atlantic Ocean. Oppressive heat there was, and at times it was excessively so, but the almost constant presence of a breeze, though frequently light, was sufficient



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to prevent that almost intolerable combination of high temperature, high humidity and a stagnant air from which there is no escape. The Islands are on the edge of the region of trade winds, which here keep up a steady flow, mostly from northeast, east or southeast, according to the season.

The rainfall varies greatly from year to year. In the five years from 1898 to 1902 the annual amount ranged from 38 inches to 62 inches. The average annual fall is approximately 50 inches. The rains are mostly of short duration, but frequent, and occasionally heavy. The average number of days with rain during the course of the year is about 150, with the greatest frequency in the summer and fall months. Thunderstorms occur in all the months of the year but are most frequent in the summer months.

The Islands are apparently healthful and remarkably free from the diseases generally associated with warm climates. In addition to the favorable climatic condition of the Islands, they afford a pleasing, though somewhat limited, variety of tropical vegetation, marvelous beauty of the surrounding waters, and abundant opportunity for sailing and fishing, all of which combine to offer a constant temptation to the visitor to lead an outdoor life.

While the Islands admirably meet the requirements of those who desire to spend a few restful months in quiet and congenial surroundings, or of the invalid in search of health, the atmosphere lacks the tonic effect so characteristic of our more northern climates, which make great exertion possible in all affairs of life.

TEMPERATURE.

In most regions where a marine climate prevails, there is comparatively little variation in temperature conditions from month to month, or from one year to another. A few years of carefully made observations will generally yield safe normal and extreme values for such localities. Out of the long series of observations available for Nassau, selection has been made for special consideration of the observations covering the five-year period from 1898 to 1902. The small island of New Providence, upon which Nassau is built, is in the midst of the group constituting the Bahama Islands and its climatic conditions will fairly represent conditions in the entire group. All observations cited in the following pages, unless otherwise stated, were made at Nassau from 1898 to 1902.

MEANS AND EXTREMES OF TEMPERATURE AT NASSAU.

	Mean.	Mean Minimum.	Mean Maximum.	Absolute Minimum.	Absolute Maximum.
January	71.2	64.4	77.9	55	84
February	70.6	64.0	77.3	53	88
March	73.2	66.8	79.5	58	88
April	75.2	69.6	80.9	60	91
May	78.2	72.9	83.4	63	93
June	81.5	76.0	87.0	71	98
July	82.6	76.6	88.6	69	96
August	83.4	76.9	89.8	69	95
September	82.1	75.7	88.5	69	96
October	79.4	74.6	84.2	68	93
November	75.4	70.3	80.4	57	90
December	72.7	67.4	78.0	55	87
Annual	77.1	71.3	83.0	53 Feb. 14, 1899.	98 June 25, 1898.

The seasons are not sharply marked by temperature changes as in regions farther north. The mean of the three winter months is 71°. From June to September the average monthly temperature is extremely constant, varying only between the limits of 81.5° for June and 83.4° for August, with an average for the four warmest months of 82.4°. Hence the difference between the winter temperatures and those of summer is only 11.4°. The mean of the early morning temperatures in winter is 65.0°, while the mean for the warmest part of the day is 77.7°. In the summer months the morning minimum and afternoon maximum heat averages 76.3° and 88.5° respectively.

The figures cited in the preceding paragraph are average seasonal values and do not show the limits of variability. The absolute extremes of temperature noted, while showing a much greater range, are still small enough to demonstrate the marine character of the climate. The lowest temperature recorded during the five-year period under consideration was 53°, which occurred on the 14th day of February, 1899. The highest during the same period was 98°, recorded on the 25th day of June, 1898.

Absolute Extremes of Temperature at Nassau.

A careful examination of the published records from 1853 to 1886, and of the manuscript records from 1898 to 1902, covering in all a period of 39 years, shows the following figures of extreme heat and cold experienced at Nassau during each month of the year. The year and day of occurrence are added in each case.

ABSOLUTE EXTREMES OF TEMPERATURE AT NASSAU.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Min............	49	53	49	54	61	63	66	66	64	63	58	48	48
Year..........	1866	1865	1869	1869	1869	1869	1885	1869	1869	1857	1865	1868	1868
Date..........	10	2	2	16	23	12	23	2	7	28	....	25	Dec.
Max...........	96	97	91	96	100	102	106	99	109	96	99	97	109
Year..........	1871	1871	1856	1872	1856	1870	1870	1871	1870	1872	1877	1870	1870
Date........ ..	28	16	14	10	10	21	14	2	27	2	8	22	Sept.

The lowest temperature recorded in 39 years (namely, 48°, or 16° above the freezing point of water) occurred in 1868 on December 25. The absolute minimum for six months of the year was recorded in the year 1869.

The maximum attained a surprisingly high mark in the year 1870, exceeding 100° in three months, with an absolute maximum of 109° in September. That the absolute extremes of temperature in 39 years should have occurred in consecutive years, while surprising, is not without a parallel. A similar coincidence occurred in the years 1898 and 1899, when records for greatest heat and cold respectively were broken in many parts of the United States.

Extremes of Temperature at Cat Cay.

The following summary of extremes of temperature at Cat Cay is based upon the record of Mr. Arthur S. Haigh during the years 1896 to 1900. Cat Cay is a small island on the extreme western edge of the Bahama group and not more than 60 miles east of the Florida coast and on the eastern edge of the Gulf Stream.

EXTREMES OF TEMPERATURE AT CAT CAY.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Maximum.....	77	79	81	83	84	90	90	91	89	85	80	78	91
Minimum......	66	68	69	72	75	80	80	71	79	77	74	69	66
Range.........	11	11	12	11	8	10	10	20	10	8	6	9	25

The extremely small variability shown by the above figures is undoubtedly due to the proximity of the observing station to the warm waters of the Gulf Stream.

Comparative Temperature Data.

Comparative readings of winter and summer temperatures are given below in order to show the relative climatic position of the Bahamas.

COMPARATIVE TEMPERATURE DATA.

Place.	Annual Mean.	Mean of Warmest Month.	Mean of Coldest Month.	Difference.
Nassau	77°	83°	71°	12°
Havana	77	82	71	11
Santiago	79	83	74	9
San Juan	79	82	76	6
Kingston (Jam.)	78	81	76	5
St. Thomas	80	83	77	6
Barbados	80	81	78	3
Trinidad	77	78	75	3
Bermuda	69	79	62	17
Jupiter, Fla.	72	82	67	15

Place.	Mean of Annual Maxima.	Mean of Annual Minima.	Difference.
Nassau	95°	55°	40°
Havana	100	55	45
Porto Rico	97	64	33
Trinidad	89	64	25
Jupiter, Fla.	93	31	62

RELATIVE HUMIDITY.

The amount of moisture in the atmosphere is a factor of the highest importance, especially in its influence upon personal comfort. The Nassau observations show the presence throughout the year of a high humidity. The official records give the average monthly values for the hours of 9 a. m. and 3 p. m. The daily means determined from observations at these hours give a value about 6 per cent too low, as the hours between sunset and sunrise, when the percentages are highest, are not represented.

A continuous record of variation in humidity throughout the day was obtained during our stay in the Islands from June 25 to July 20, by means of a Richard hygrograph. This record made it possible to apply a correction to the mean for the 9 a. m. and 3 p. m. observations in order to arrive at the true daily mean humidity based on 24 hourly observations. The corrected monthly values are shown in the column marked " mean " in the table below. The humidity during the night hours ranges between 85 per cent and 90 per cent, and during midday is about 73 per cent. The amount of moisture in the atmosphere is remarkably uniform throughout the year, while the daily range is small, not varying much from 15 per cent. Such humidities as these combined with the high temperature of the Islands would be very oppressive were it not for the almost constant presence of a breeze. The presence of so much moisture in the atmosphere is undoubtedly instrumental in diminishing the power of the direct rays of the sun.

MEAN RELATIVE HUMIDITY.

	9 A. M. Per Cent.	3 P. M. Per Cent.	* Daily Mean. Per Cent.
January	79	74	82
February	77	74	82
March	73	69	77
April	73	70	78
May	74	68	77
June	72	73	78
July	73	75	80
August	69	69	75
September	74	73	80
October	74	72	79
November	72	69	76
December	76	70	79
Year	74	71	78

* Corrected to daily means based on 24 hourly observations.

CLOUDS AND SUNSHINE.

There is an abundance of bright sunshine throughout the year. The Islands being within the westward extension of the area of high barometric pressure over the Atlantic Ocean a large portion of the year share with this area much of its fine weather. Overcast skies are not persistent. The average amount of cloudiness does not vary greatly from month to month. It is slightly greater in the summer and fall months than during the winter. Cloudiness is least in January and February and greatest, on the average, in October. The distribution throughout the year is indicated in the following table showing the monthly average values at 9 a. m. and 3 p. m. for a period of five years.

AVERAGE CLOUDINESS.

(10, completely overcast; 0, practically clear.)

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sep.	Oct.	Nov.	Dec.	Year.
9 a. m.	5.0	4.9	5.6	5.6	5.8	7.3	6.7	6.9	7.2	7.8	6.6	6.2	6.3
3 p. m.	4.9	5.3	5.1	5.1	5.6	6.5	7.5	7.1	7.5	7.8	5.9	7.1	6.3

RAINFALL.

The rainfall varies greatly in amount from year to year. The average annual fall approximates 50 inches. Fully four-fifths of the total annual precipitation occurs from May to October, leaving but one-fifth for the winter and early spring months. During the five years from 1898 to 1902, the heaviest rainfall occurred in the month of August. During the summer months the rainfall is frequently excessive in amount, but, as a rule, the duration is short. Included in the equipment for a study of the climate of the Islands was an instrument designed to register automatically the beginnings and endings of rainfall, by means of which a record was obtained of all local rains, both heavy and light, from June 23 to July 19. The record

shows the showers of June and July to have been of very brief duration, without exception. Thirty-six separate showers were recorded during 17 of the total of 27 days. Of these, the heaviest and of longest duration lasted but one hour. The average duration was not over ten minutes for each shower.

The average monthly amount of rainfall, the maximum amounts recorded in any 24 consecutive hours, and the average frequency of days with rain, are indicated in the following table:

RAINFALL AT NASSAU.

(In inches and hundredths.)

	Average Monthly Amounts.	Maximum in 24 Hours.	Average Number of Days With Rain.
January	1.20	0.40	10.4
February	1.15	0.62	7.6
March	1.09	0.70	6.8
April	1.92	0.94	7.8
May	4.66	1.28	9.6
June	5.65	1.91	13.4
July	5.19	1.92	18.8
August	9.09	2.72	19.6
September	8.05	2.26	17.6
October	7.80	2.56	19.0
November	1.95	0.95	9.2
December	1.68	0.66	12.0
Year	49.43	2.72	151.8

Annual maximum .... 91.50 inches in 1865.
Annual minimum .... 25.54 inches in 1882.

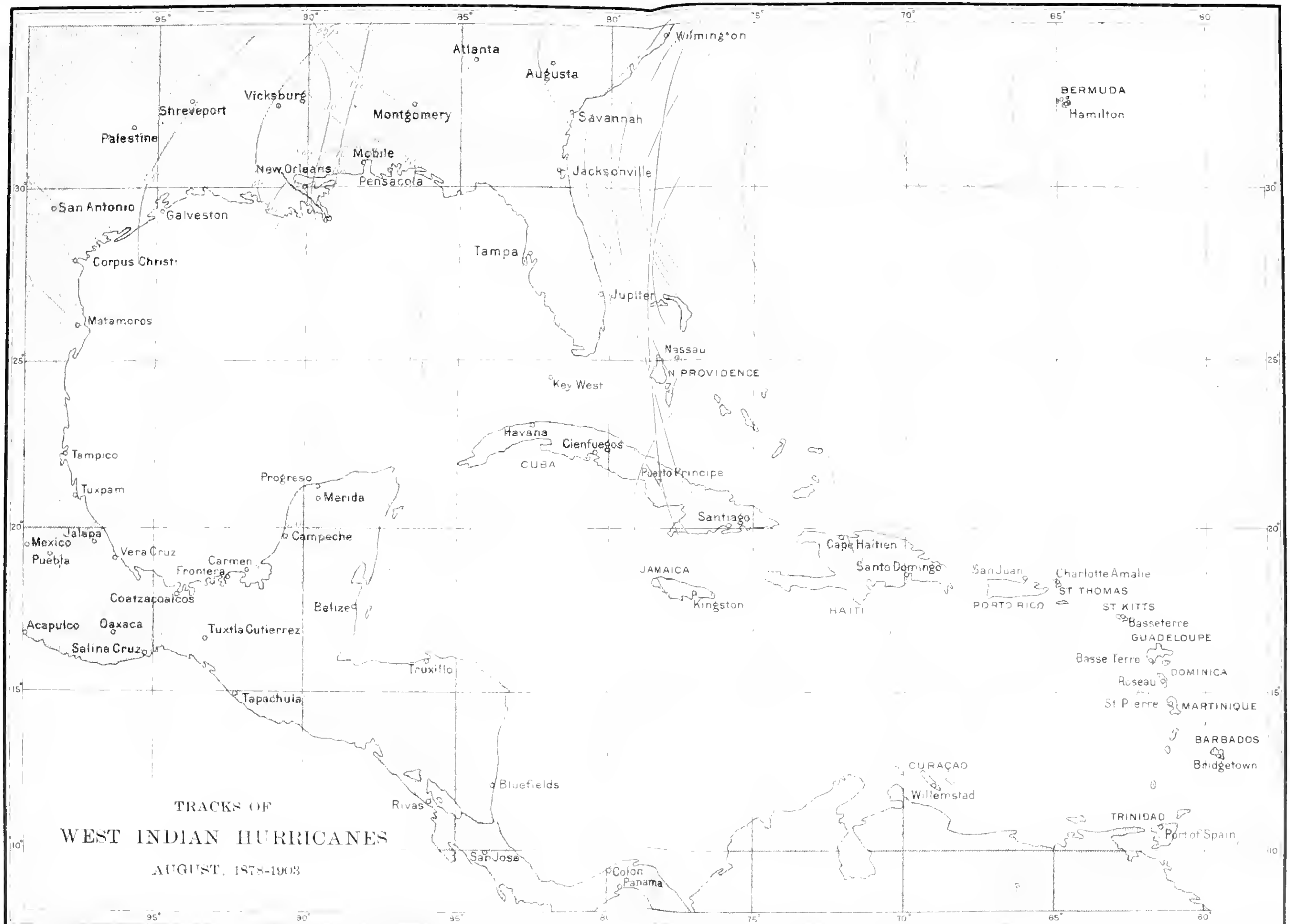
RAINFALL AT CAT CAY.

(For 1896, 1897, 1898, 1900. Record incomplete.)

Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
1.11	2.21	2.15	2.75	3.91	4.09	5.37	5.40	7.52	5.86	1.82	1.36	43.86

WIND DIRECTION.

The geographical position of the Islands on the southwestern edge of the persistent area of high barometric pressure which covers the North Atlantic Ocean causes a prevailing easterly wind throughout the year. The group is on the northern edge of the regular trade wind belt, in which there is a steady flow of the atmosphere from the east, or the points between northeast and southeast, with a preponderance of east winds. The relative frequency of winds from the different points of the compass during the course of the year is indicated in the following table of statistics covering a period of five years.



TRACKS OF

WEST INDIAN HURRICANES

AUGUST, 1878-1903

PREVAILING WIND DIRECTION.

(The average number of days per month upon which the indicated wind prevailed.)

	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm.
January	4.4	6.1	8.2	5.2	1.8	1.1	0.8	1.8	1.6
February	4.3	5.1	4.3	2.6	4.2	2.0	0.8	3.1	1.6
March	2.4	4.3	7.8	6.4	4.8	1.4	0.7	2.6	0.6
April	2.5	6.4	6.5	5.5	3.2	1.2	0.3	3.8	0.9
May	2.0	6.0	11.5	2.6	3.5	1.2	0.9	2.9	0.4
June	0.8	3.1	13.5	7.1	2.7	0.7	0.4	0.1	1.6
July	0.4	3.0	13.0	9.3	2.4	0.1	...	0.1	0.7
August	1.1	5.3	9.9	7.6	3.0	1.2	0.1	0.3	2.5
September	2.1	3.7	8.6	8.2	2.3	1.3	0.6	1.3	1.9
October	3.2	8.3	7.0	3.9	1.6	1.4	0.8	1.5	3.3
November	3.4	9.0	9.5	3.0	1.3	0.8	0.3	1.5	1.2
December	3.9	6.9	9.3	2.6	2.8	0.8	1.0	2.4	1.3
Year	30.5	67.2	109.1	64.0	33.6	13.2	6.7	21.4	17.6

Converting the total frequencies for the year into percentages of the total number of days in the year, we have the following as the relative frequency from each direction:

PERCENTAGE OF FREQUENCY OF WINDS.

N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm.
8	18	30	18	9	4	2	6	5

WIND VELOCITY.

A year's continuous record of wind velocity at the Bahama Cable Office at Nassau shows the average hourly velocity from July 1, 1902, to June 30, 1903, to have been as indicated in the following table. The winds are strongest and steadiest in the winter and spring months, and lightest in the late summer and early fall. In the diurnal period of the winds, the velocity increases steadily from the early morning hours to a maximum near noon.

DAILY WIND MOVEMENT AT NASSAU.

(In miles per hour.)

From	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
9 a. m. to noon	10	14	11	12	10	9	8	8	8	7	12	12	10
Noon to 6 p. m.	10	12	10	11	14	8	9	7	7	7	10	6	9
6 p. m. to midnight	8	10	8	8	8	6	6	5	5	6	9	12	8
Midnight to 6 a. m.	9	9	8	9	8	5	6	5	4	6	9	10	7
6 a. m. to 9 a. m.	9	8	9	10	9	9	10	5	5	6	8	11	8
Hourly average	9	11	9	10	10	7	8	6	6	6	10	10	8

The average hourly velocity during the period from June 17, 1903, the day of our arrival at Nassau, to July 7, 1903, as recorded at the Cable Office, is as follows:

AVERAGE HOURLY VELOCITY OF WIND.

(In miles per hour.)

Hours ending.	1	2	3	4	5	6	7	8	9	10	11	
Morning.......	5.4	5.0	5.0	5.6	5.6	5.7	5.6	7.0	8.2	8.8	9.1	10.0 Noon.
Afternoon.....	9.9	9.9	9.6	8.5	8.5	7.6	6.8	6.2	5.8	5.8	5.8	5.7 Mdnt.

THUNDERSTORMS.

The Islands are free from violent atmospheric disturbances during the greater portion of the year. A comparatively mild type of thunderstorm occurs in all months of the year, but they are of rare occurrence in the winter months. These storms are of short duration and are frequently accompanied by very heavy showers. Even in the season of greatest frequency they average but 4 or 5 per month. In the five years from 1898 to 1902, the average annual number was 29 and the seasonal distribution as indicated by the following figures:

AVERAGE FREQUENCY OF THUNDERSTORMS.

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
0.8	0.6	1.2	1.2	3.0	3.2	5.8	7.2	3.2	2.6	0.2	0	29

One of the members of the Expedition was fortunate enough to secure an admirable photograph of a typical thunderstorm as it appeared at sea, where nothing was present to interfere with a comprehensive view of the disturbance throughout its entire extent. This photograph was taken just north of Abaco, and a reproduction is shown in Plate XVII, Fig. 2.

HURRICANES.

The Bahama Islands lie in the midst of the tracks of the West India hurricanes. The line marking the mean path of these fierce tropical storms passes across the eastern edge of the group during August, and along the western edge during the month of September. In October the center of activity again recedes eastward to its July position. The hurricane is the severest type of cyclonic storm and has been dreaded by the inhabitants of the Islands, and especially those sailing the seas, from time immemorial. They are not of very frequent occurrence, fortunately, and they are confined practically to the months of August, September and October. Occasionally one will appear as early as June and July, and even as early as May, but most of these storms occur in August, September and October, after which there is an abrupt cessation, only one storm of the kind having been recorded in 25 years in the month of November.

Frequency of Hurricanes.

A former Director of the observatory at Havana, M. Poëy, many years ago gathered statistics in regard to hurricanes in the West Indies and succeeded in collecting evidence of 355 which visited the West Indies from 1493 to 1855. An incomplete list of later compilation added twelve more for the years from 1856 to 1877. The storms of this class occurring since 1878 have been fully described and carefully studied by Mr. Garriott in an interesting report[1] recently issued by the U. S. Weather Bureau. The reader is referred to this bulletin for a detailed account of the hurricanes occurring within this period and for general information concerning the origin and path of the storms. The charts published in Bulletin H are reproduced in Plates XVIII to XXIV, with the addition of the storms occurring from 1901 to 1903 inclusive.

Classifying the 355 hurricanes in M. Poëy's list which occurred from 1493 to 1855, and those in Mr. Garriott's list of 98, which occurred between 1878 and 1900, we have the following distribution by months:

FREQUENCY OF HURRICANES.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Yr.
Poëy (1493-1855)	5	7	11	6	5	10	42	96	80	69	17	7	355
Garriott (1878-1900).	3	0	0	0	1	3	3	25	25	32	3	3	98

The above tabulation shows that the storms are almost entirely restricted to the months of August, September and October. The accompanying charts reproduced from Weather Bureau Bulletin H, bring out vividly the sudden increase in the number of these storms during the month of August and their equally rapid cessation in November. The path and daily progress of every storm of consequence occurring since 1878 is shown upon these charts.

These storms mostly originate, or first appear within our field of view, in the neighborhood of the Windward Islands, move in a direction between west and northwest at the rate of about 10 or 12 miles per hour, and recurve to northward and then to northeastward approximately in the neighborhood of Florida, or within the area of the Bahama group of islands. They are similar in form and structure to the temperate region storms which are so familiar to us, especially in the fall and winter season, but differ from these in being more restricted in their area and more intense in the destructive

[1] West Indian Hurricanes, E. B. Garriott, Bull. H., U. S. Weather Bureau, Wash., D. C., 1902.

force of the winds accompanying them. The fall of the barometer in the center of these storms is more rapid and is greater than in the case of temperate region cyclones. Their rate of movement is considerably less; this is a fortunate circumstance, as it enables us after once detecting the presence of such storms by means of telegraphic reports to give ample warning of the probable path of the storm. As they recurve northward and enter our latitudes, they gradually enlarge their area, at the same time losing in power, and finally merge into the type of temperate region cyclones which originate in the Gulf of Mexico.

In the destructive violence of the accompanying winds, the hurricane is second only to the tornado of the Mississippi Valley. The area of disturbance in the hurricane is, however, very much larger than that of the tornado. Some idea of the tremendous power exhibited in these tropical storms is suggested by Figs. 1 and 2, Plate VII. These illustrations show a portion of the shore of one of the small islands of the Bahama group. The huge rocks seen in the foreground, some of them weighing several tons, were torn up and piled upon the beach by the force of the hurricane winds and waves.

The premonitory signs and physical features of hurricanes are well described by Mr. Bigelow in the following paragraph quoted from a paper on "Cyclones, Hurricanes and Tornados" in the Yearbook of the U. S. Department of Agriculture for 1898, at page 531.

"The physical features of hurricanes are well understood. The approach of a hurricane is usually indicated by a long swell on the ocean, propagated to great distances and forewarning the observer by two or three days. A faint rise in the barometer occurs before the gradual fall, which becomes very pronounced at the center; fine wisps of cirrus clouds are first seen, which surround the center to a distance of 200 miles; the air is calm and sultry, but this is gradually supplanted by a gentle breeze, and later the wind increases to a gale, the clouds become matted, the sea rough, rain falls, and the winds are gusty and dangerous as the vortex core comes on. Here is the indescribable tempest, dealing destruction, impressing the imagination with its wild exhibition of the forces of nature, the flashes of lightning, the torrents of rain, the cooler air, all the elements in an uproar, which indicate the close approach of the center. In the midst of this turmoil there is a sudden pause, the winds almost cease, the sky clears, the waves, however, rage in great turbulence. This is the eye of the storm, the core of the vortex, and it is, perhaps, twenty miles in diameter, or one-thirtieth of the whole hurricane. The respite is brief, and is followed by the abrupt renewal of the violent wind and rain, but now coming from the opposite direction, and the storm passes off with the several features following each other in the reverse order."

The duration and continuity of these storms vary greatly. In his paper

on West India Hurricanes,[2] Mr. Page describes two storms, one of extreme brevity and another of great duration and length of track.

"On the morning of September 26, 1898, a hurricane of small area but of great intensity was discovered, central to the west of Eleuthera. By the 27th it had reached the coast of Great Abaco, recurving toward the northeast. On the 28th all traces of the storm had disappeared, nor was it again reported. At the opposite extreme stands the Porto Rican hurricane of August, 1899, the path of whose center was traced day after day from its position southwest of the Cape Verde Islands, August 3, westward to the coast of Florida, northward to the Capes of the Chesapeake, and eastward to the center of the Mediterranean sea, the whole trajectory occupying 37 days."

Law of Hurricanes.

The Rev. Benito Viñes, S. J., for many years Director of the observatory at Havana, and a lifelong student of meteorology, devoted much time to the study of West Indian hurricanes. Probably no one was better qualified than he to write with authority concerning the origin and nature of these storms. Father Viñes died in the year 1893. An unpublished manuscript of his, entitled "Investigation of the Cyclonic Circulation and Translatory Movement of West Indian Hurricanes," was translated by his friend, Dr. C. Finley, of Havana, and was recently printed by the U. S. Weather Bureau and issued as a special publication.[3]

This pamphlet probably contains the most satisfactory exposition of the laws and phenomena of hurricanes that we have at present. A few of the paragraphs which are appropriate to so brief a sketch are here quoted. One of the most marked of the phenomena attending the progress of these storms, and one of the most difficult to explain, is the parabolic path pursued, and the form and geographical position of the recurving portion of the path. As Father Viñes's explanation of these features embodies also much general information on other interesting points connected with the nature and movement of hurricanes, somewhat extended quotations are made from his pamphlet.

Theoretical Importance of the Law of Recurving.—"Theoretically speaking this law is so intimately connected with the changes in the sun's declination and with the several positions occupied, according to seasons, by the equatorial zone of calms and rains, by the zones lying on the limits of the trade winds and by the anticyclone of the Atlantic, that, in my opinion, if this law had not been discovered *a posteriori* we would have to suspect *a priori* that it existed.

[2] West India Hurricanes. By James Page. Hydrogr. Office, Bull. No. 86, Wash., 1901.

[3] U. S. Weather Bureau, Publ. No. 168, Wash., 1898.

This law is also connected with the changes of direction experienced by the general upper current in the tropical regions. In fact, during the whole year, in Habana, if we except the hurricane season, the upper currents come from the west. In the first half of June and particularly in the second half of October, the currents of the cirrus clouds incline to the south and southwest which is precisely where the cyclones come from at that time of the year, for they reach us as they are about to recurve, or just after recurving. From the end of June to the beginning of October, the upper current sets from the east, and this is (without any exception whatever in all the observations that I have made so far) the only time of the year when the cirrus clouds come from that quarter. This fact, when taken in connection with the tracks of the cyclones, is very significant; for, precisely at that time, if a cyclone advances toward Habana, it has necessarily to come from the east, since it must recurve to the north of the tropic and consequently we must receive it in the first branch of its track. On the contrary, excepting in the season just mentioned, in all the rest of the year, the cyclones that pass by Habana, or in its vicinity, are all more or less from the west and never from the east. In fact the cyclones of the end of October all come from the third quadrant, having previously recurved. Those of November, December and January all pass to the north of Habana in a northeast direction, as cyclones moving along the second branch of their track. In all the rest of the year they pass to the north of and at a greater or less distance from Habana more or less in the direction mentioned above. The facts that I have brought forward seem to indicate that the cyclones are directed along their tracks by the upper currents, which to my mind seems highly probable.

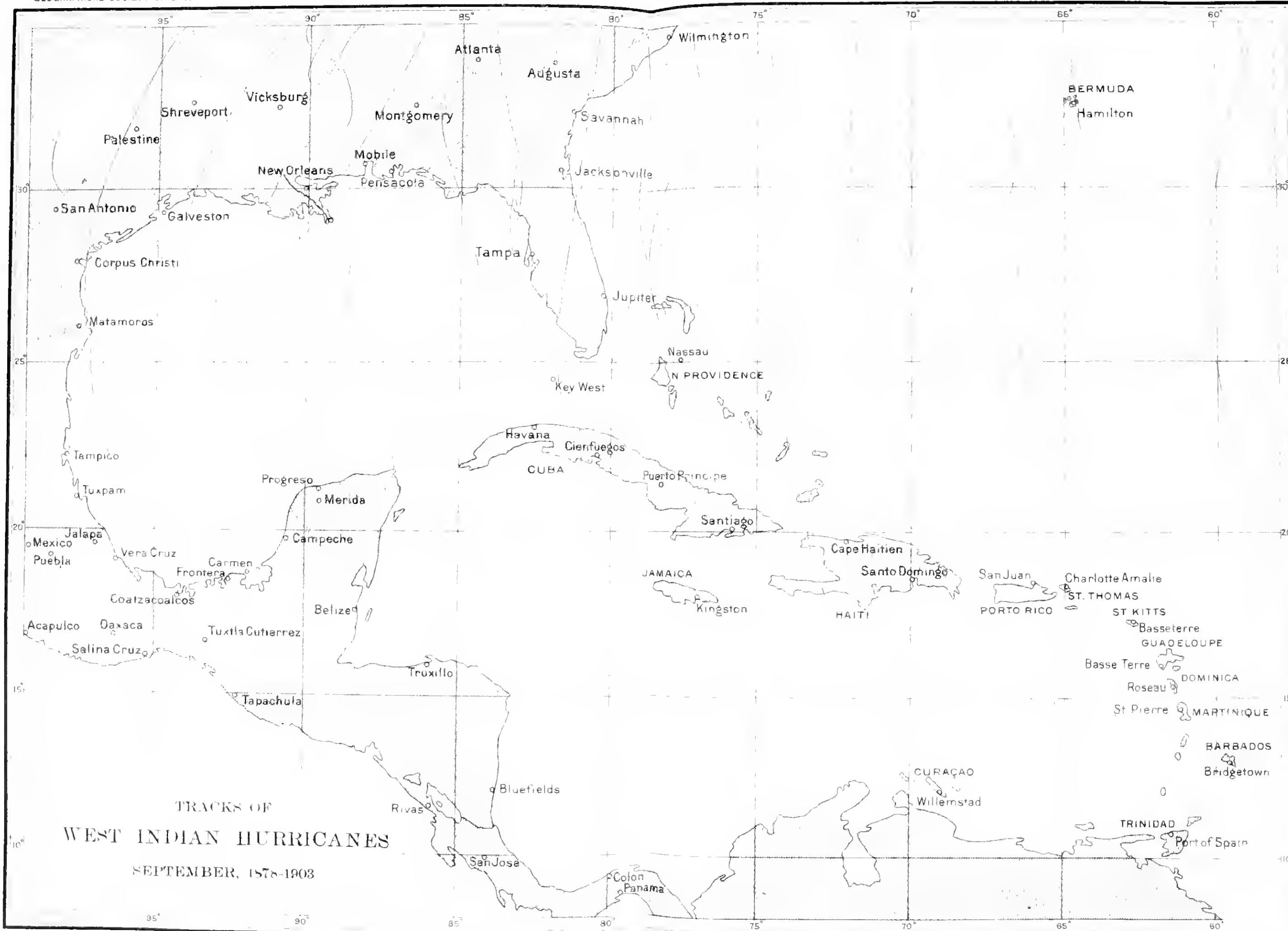
The law of recurving has also intimate connection with the greater or less cyclonic activity in the West Indian seas during the different months. The maximum and minimum latitudes reached by the recurving point correspond respectively to the maximum and minimum of cyclonic activity.

In the second fortnight of August the hurricanes are, in general, more numerous and more violent; they move along their tracks with greater velocity, reach greater altitudes, and the parabola which they describe is very wide, so that whatever be the force that, projectile-like, impels the cyclone, its reach and amplitude are greater, and so consequently must be its impulsive energy. Besides, if the general currents direct cyclones in their courses, this fact would denote that at this time of the year these currents attain their maximum activity and reach higher latitudes. The second fortnight of August and the beginning of September are moreover the epochs for simultaneous or twin cyclones; so much so that in 1886, during the last decade of August, there were at one time four cyclones around Habana: One in the island to the east-southeast, one to the northeast, and two more in the Gulf of Mexico. Excepting at this season I only know of three cases of simultaneous cyclones near Habana, one occurring in September and two in October.

In July and September the cyclones are less numerous, generally less violent, they move along their tracks with less velocity, are more inclined to the west and describe narrower parabolas.

Finally, in June so few cyclones are observed that they are scarcely sufficient to establish a law. In October they are somewhat more numerous, but still few; some are quite intense; they move with but little velocity along the first branch of their track and while recurving.

The relative position of the seas and continents appears to have some influence on the recurving of hurricanes, for any one may observe that a great number of the cyclones of August recurve in the Gulf of Charleston without extending to


Wilmington
Atlanta
Augusta
Vicksburg
Shreveport
Montgomery
Palestine
BERMUDA
Hamilton
Savannah
Mobile
New Orleans
Pensacola
Jacksonville
San Antonio
Galveston
Tampa
Corpus Christi
Jupiter
Matamoros
Nassau
N PROVIDENCE
Key West
Havana
Cienfuegos
CUBA
Tampico
Puerto Principe
Progreso
Merida
Tuxpam
Santiago
Jalapa
Mexico
Campeche
Puebla
Vera Cruz
Carmen
Frontera
Cape Haitien
JAMAICA
Santo Domingo
San Juan
Charlotte Amalie
ST. THOMAS
Coatzacoalcos
Belize
Kingston
HAITI
PORTO RICO
ST KITTS
Acapulco
Oaxaca
Tuxtla Gutierrez
Basseterre
Salina Cruz
GUADELOUPE
Truxillo
Basse Terre
DOMINICA
Roseau
Tapachula
St Pierre
MARTINIQUE
BARBADOS
Bridgetown
CURAÇAO
Bluefields
Willemstad
Rivas
TRINIDAD
Port of Spain
San Jose
Colon
Panama
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SEPTEMBER, 1878-1903

the continent, and many of those of July and September recurve on the coast of Texas.

The law of general routes or geographical zones pursued by hurricanes.—It must, of course, be admitted that the tropical cyclones do not form indefinitely at any point within the tropical zones, but that they single out, in preference, for their formation and development, particular and definite regions in those zones. The following geographical conditions, generally, and in a more or less perfect degree, distinguish the cyclonic regions within the Tropics: Large continents lie to the west, indented by numerous gulfs and bays whose coasts run more or less northward and southward, with vast and extensive seas to the east, overspread commonly with numerous islands. Such at any rate are the features that in a more or less perfect degree concur in the cyclonic regions of the Philippine Isles and in the China Sea, in the seas of India, and also in the Southern Hemisphere, in the region situated east of Africa, in the vicinity of the islands of Madagascar, Mauritius, Reunion, Rodriguez, etc. But of all the cyclonic regions within the intertropical zone the one which more perfectly and grandly combined all these conditions is the great "Bay of North America," with its wide Atlantic Ocean extending to the east as far as the coast of Africa and to the northeast as far as the coast of Europe and the northern seas. In my opinion this contributes much to the grandeur and regularity of the immense paths of the West Indian cyclones. A cyclone of August or September may form in the vicinity of the Cape Verde Islands, near the coast of Africa, or to the east of the Lesser Antilles, cross the Atlantic along the first branch of its track, and recurve either in the Gulf of Charleston or on the coast of Texas. In the latter case it may cross the United States in the direction of Cape Hatteras, sweep, with renewed strength and velocity, a second time across the Atlantic, in a northeastward direction, and enter Europe or be lost in the northern seas. We have, then, a series of cyclones which describe immense tracks over many thousands of miles with admirable regularity and normality, and subject to general laws. This is truly surprising and astounding. I do not believe that on the face of the globe there is another region where cyclones are met with that can compare with those of the West Indies, or, rather, I should say, with those of the great Bay of North America. Neither is there within the whole intertropical zone a grander bay than this one, nor one which offers more favorable conditions for the development and onward progress of gyratory storms.

The Bay of North America comprises, as I understand, that part of the Atlantic to the west of the fifty-fifth meridian (longitude west of Greenwich) from Newfoundland to Dutch Guiana. It is bounded on the east by the said meridian and on the north, west and south by the coasts of Newfoundland, Labrador, and Gulf of St. Lawrence, by the coasts of the Atlantic, Gulf of Mexico, and Caribbean Sea from Yucatan to Dutch Guiana. It embraces the West Indies, the Caribbean Sea, the Gulf of Mexico, the Bahamas, the Bermudas, and the Gulfs of Charleston and of the St. Lawrence.

Law of the relative velocity of translation.—We can divide the cyclonic track into three parts: First branch; recurve; second branch. Having made this division, I shall now formulate the law. In the first branch of the track, from the origin of the cyclone to the vicinity of the recurve, the velocity of translation is generally slightly on the increase. In the vicinity of the recurve the hurricane moderates the velocity of its advance, which reaches its minimum in the recurve. Finally, the velocity of translation is rapidly on the increase in the second branch, and attains a maximum of more than 30 and even 40 miles per hour."

EXPLORATION OF THE UPPER ATMOSPHERE AT NASSAU, NEW PROVIDENCE, BY MEANS OF KITES

EXPLORATION OF THE UPPER ATMOSPHERE AT NASSAU, NEW PROVIDENCE, BY MEANS OF KITES[1]

BY

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INTRODUCTION.

Included in the equipment of the Bahama Expedition of the Geographical Society of Baltimore was a complete outfit for investigating on a small scale the conditions of the upper atmosphere. This apparatus was loaned to the Director of the Expedition by the Chief of the Weather Bureau. It consisted of one medium-sized and one large box kite (Plate XVI, Fig. 2, and Plate XVII, Fig. 1), two meteorographs (Plate XVI, Figs. 1 and 2), a hand reel with 15,000 feet of steel piano wire, and a nephoscope for altitude measurements. In addition, the instrumental equipment included a Richard barograph, a thermograph, and a hygrograph, a sling psychrometer, a rain gage, and a rain recorder, the property of the Maryland State Weather Service.

Head winds and rough weather caused considerable delay and inconvenience on the outward voyage, and the Expedition did not reach Nassau until the 17th of June. Through the courtesy of Mr. H. M. Flagler, the use of the grounds and clubhouse connected with the Colonial Hotel was kindly granted for the kite experiments. These grounds were by far the most suitable place to be found in the vicinity of Nassau for the purpose, being one of the few open stretches of field upon the entire Island. Situated west of the town of Nassau, along the northern coast of the Island and just below the ruins of old Fort Charlotte, the field afforded a free sweep of the air in the direction of the prevailing easterly winds of these latitudes. The Island of New Providence, upon which Nassau is situated, is a small island, measuring less than 20 miles from east to west and about 7 or 8 miles from north to south at its widest point. It lies about 150 miles to the east of the southern point of Florida, in latitude 25° north, longitude 77° 30′ west, along the northern edge of the trades.

[1] These results were first published in the Monthly Weather Review, U. S. Weather Bureau for Dec., 1903.

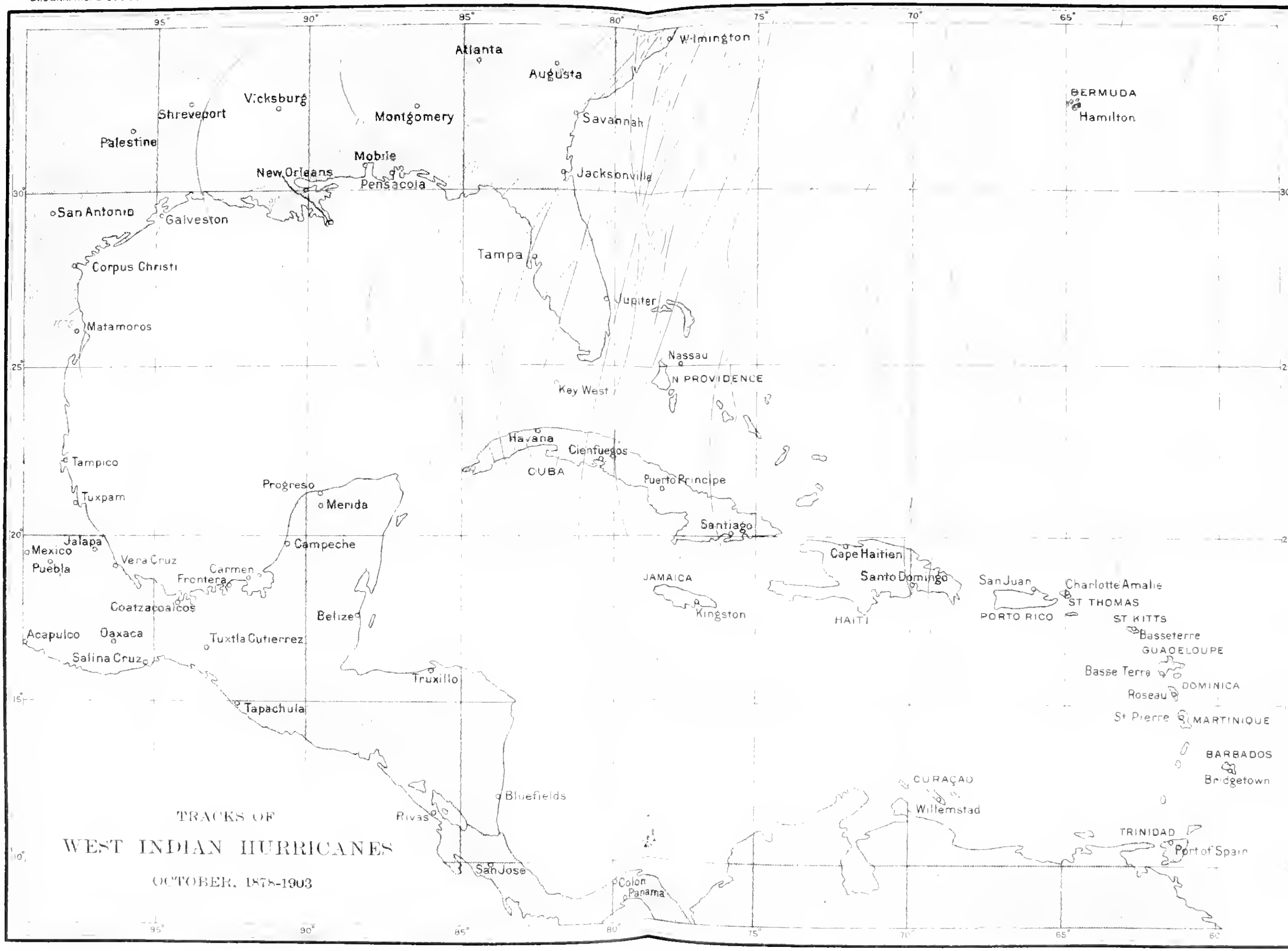
Several days were spent in unpacking and mounting the meteorological instruments and the kites, and in waiting for favorable winds. It was not until the 27th of June that the wind seemed of sufficient strength to warrant an attempt to raise a kite. At this season of the year winds above 10 miles per hour cannot be counted on daily, excepting for short periods. Beginning at sunrise with a breeze of 5 or 6 miles from the east-southeast, the strength increased by noon to 8 or 9 miles, with occasional higher velocities, but seldom exceeded 15 miles per hour.

To one accustomed to the rapid and extreme fluctuations of temperate zone weather, the tropical conditions appear monotonously uniform; clear skies with intense sunshine; a few patches of loosely formed cumulus clouds; an occasional shower of short duration; a small range of the thermometer, generally, at this season, keeping within the limits of 80° and 90°; these are conditions which may repeat themselves day after day for long periods. Though the direct sunshine is intense, the atmosphere is not excessively oppressive, being moderately dry and seldom stagnant. So far as personal comfort is concerned, these conditions are less trying than the warm, muggy days of the coastal plain of the Middle Atlantic States. In these Islands there is generally a sufficient breeze for comfort when not exposed to the direct rays of the sun; from the warm, moist and stagnant atmosphere of the Middle States there is often no escape, even under the shelter of roof or tree.

DESCRIPTION OF FLIGHTS.

A preliminary flight was made on June 27, between 11 a. m. and 1 p. m., using the smaller 7-foot kite. The wind was east-southeast, and blowing with a velocity of about 10 miles per hour. No effort was made to reach any considerable height, the main purpose being to test the kite and apparatus. The maximum elevation was slightly over 1000 feet.

In all of the experiments conducted at Nassau, the kite meteorograph was checked by means of an aneroid barometer and a sling psychrometer at the surface just before the kite was raised, and at short intervals until the close of the flight. In addition, the barograph, thermograph and hygrograph were installed in the Nassau Cable Office, about three-fourths of a mile distant, by the courtesy of Mr. P. H. Burns, Superintendent of the Bahamas Cable; these instruments in turn were checked frequently by means of eye observations of the thermometers and mercurial barometer at the Cable Office.



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OCTOBER, 1878-1903

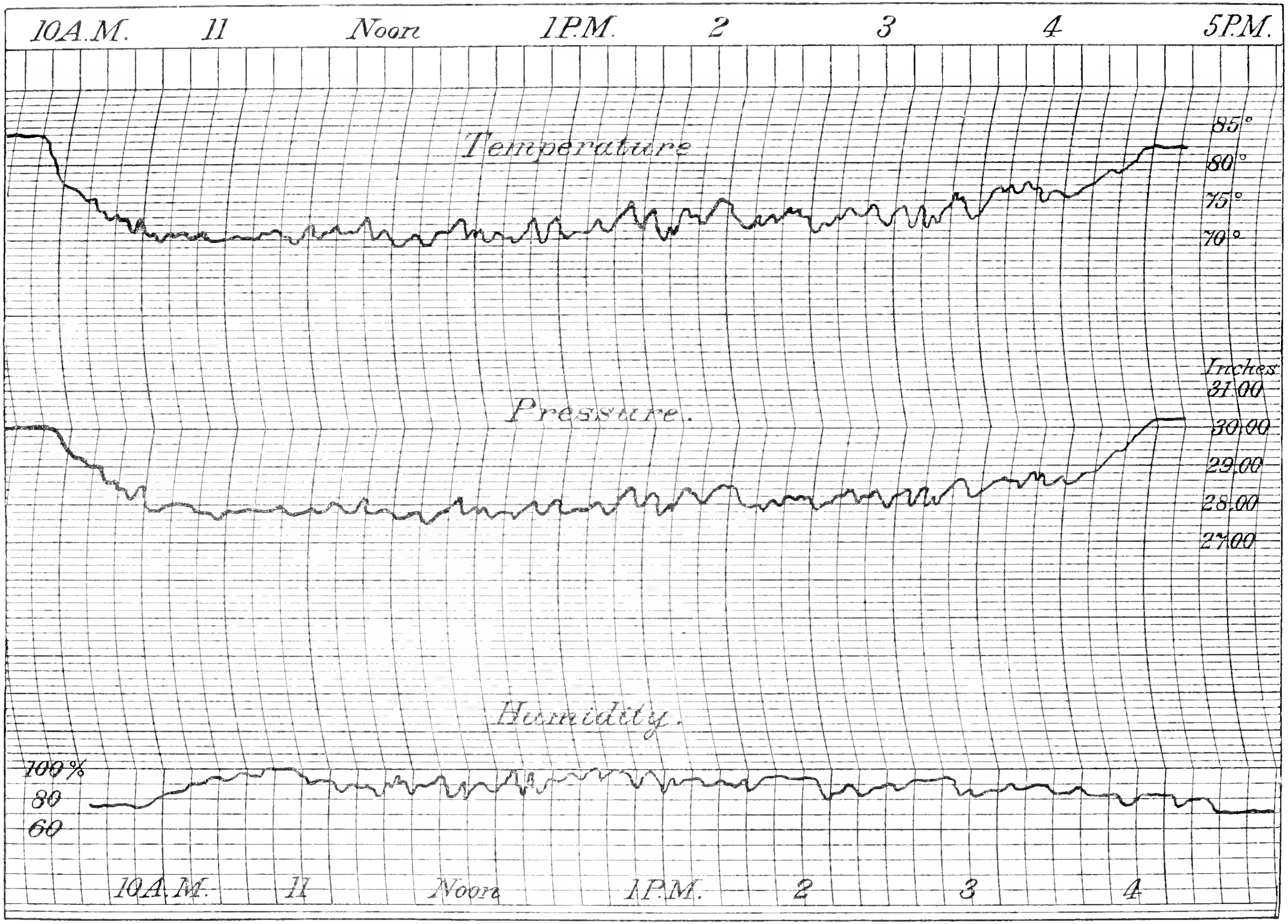


FIG. 2.—Nassau, Bahama Islands. Record made in flight of July 1, 1903, 9 a. m. to 5 p. m.

On July 1 the kite was raised at 10 a. m. and not lowered until nearly 5 p. m. The wind was east-southeast, with a velocity of 15 miles, until 1 p. m., when the velocity fell to 11 miles, which was maintained until the end of the flight. The day was marked by an unusual amount of cloudiness, varying between five and seven-tenths, mostly cumulus, with a few alto-cumulus. A light scud occasionally passed under the kite. On several occasions the kite was entirely obscured, being sometimes in the passing cloud and sometimes above it. The greatest elevation attained was about 2600 feet at 12.23 p. m., with a temperature at the kite of 69°, and a surface temperature of 83°. The atmospheric pressure, as registered on the kite meteorograph, was 27.60 inches, and at the surface 30.03 inches. It was with considerable difficulty that the kite was maintained at the higher elevations. The tracings of the kite meteorograph (see Figs. 2, 3, 4) show constant fluctuations, doubtless largely due to frequent reeling and unreeling in attempts to increase the altitude of the kite, but in a measure also to be attributed to variation in the strength of the wind.

On the following day, July 2, the larger 9-foot kite was launched. The wind was from the east-southeast, and unsteady, with a velocity varying between 8 and 10 miles per hour; the sky was from three to four-tenths clouded. Not much was to be expected under these conditions. The greatest elevation slightly exceeded 2500 feet. The kite was raised shortly after 3 p. m., and lowered a little before 6 p. m. The lowest temperature recorded at the kite was 70°, with 85° at the surface; the pressure fell from 30.03 inches at the surface to 27.60 inches at the highest level. The same irregularities in the meteorograph tracings are to be found in the records of this ascent as were noted in the previous ascent. In fact this is a characteristic of all of the tracings, which would seem to point to a rapid falling off in wind velocity above a moderate elevation.

The next ascent was attempted late in the afternoon of July 3, between 5 and 8 p. m. (Plate XVII, Fig. 1). A good strong wind was blowing from the east-southeast, the weather conditions were unsettled, the cloudiness varying from five to seven-tenths cumulus and cumulo-nimbus. A squall arose about 6.30 p. m., with a short shower of rain, during which my colleague and myself sought shelter in the clubhouse. The rain and squall lasted from ten to fifteen minutes. The kite wire was carefully grounded, but small discharges of atmospheric electricity were several times felt. We had no facilities for measuring the potential, but the shocks experienced now and then on accidental contact with the wire were not severe, even on the approach of the squall. The kite

reached an elevation of nearly 4000 feet, and was maintained at a high elevation for fully two hours without much manipulation of the reel. The kite behaved well from ascent to landing, and an interesting and valuable record was looked

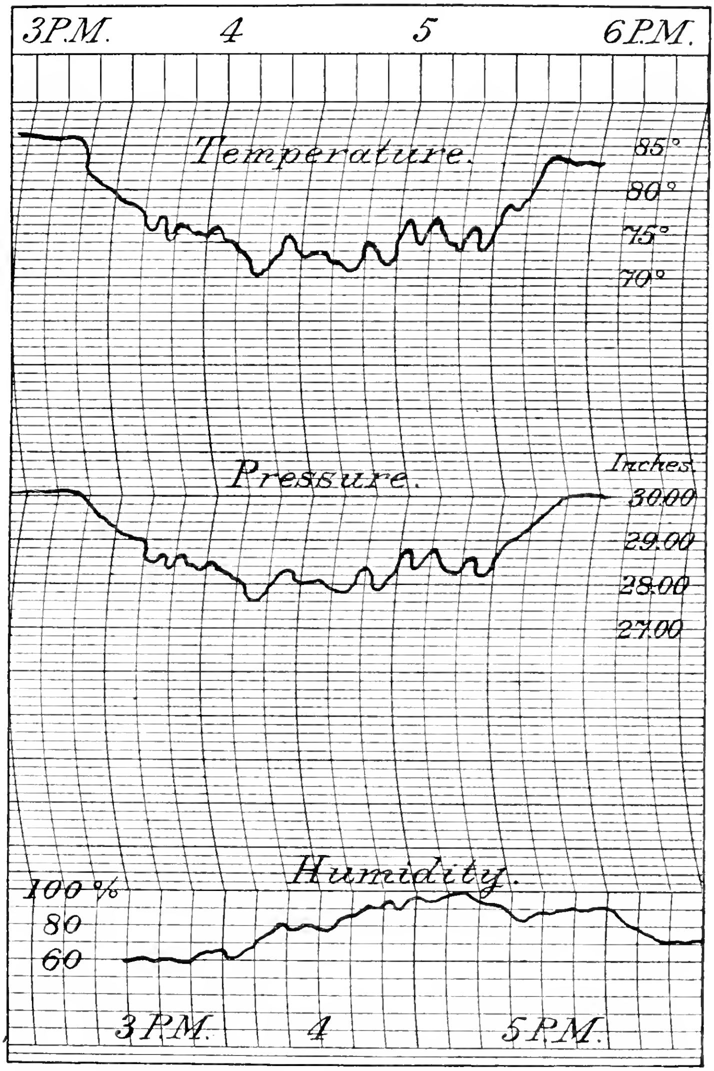


FIG. 3.—Nassau, Bahama Islands. Record made in flight of July 2, 1903, 3 to 6 p. m.

for; but to our dismay on examining the meteorograph it was found that the clock had stopped within fifteen minutes after the beginning of the ascent. Save for the maximum and minimum points of pressure, temperature, and humidity, and the altitude observations, there was no record of one of the

most interesting of the six ascents made during our stay at Nassau. The lowest temperature recorded was 65°, with a surface temperature of 78°; the lowest pressure was 26.30 inches, with 30.03 inches at the surface.

On the day preceding our departure from Nassau, namely, on July 6, we determined to try the experiment of flying one of our kites from the deck of a moving vessel. The practicability of this method had already been fully demonstrated by Mr. Rotch, Director of the Blue Hill Observatory, near Boston, and by others who followed his initiative, in the North Atlantic waters. We hoped by this method of artificially "raising a breeze" to attain a higher altitude than we had reached in the light land winds, and at the same time counted upon adding to our knowledge of the temperature and humidity conditions over the ocean in these latitudes. There was very little material to select from in the way of steam locomotion, wind being the motive power for practically all the water craft in this vicinity. The choice lay between a large and powerful steam tug belonging to the company running the regular line of steamers between New York, Nassau, and Havana, but for which a prohibitive charge was demanded, and a small steam launch used for conveying passengers across the channel to a pleasure resort on Hog Island. The smaller vessel was chosen. At 11 a. m. we left the harbor of Nassau on the *Alicia* with the larger of the two kites and the complete outfit. The party accompanying me comprised, in addition to the crew of three men, my colleague, Mr. J. E. Routh, who took charge of the nephoscope for the altitude observations, Rev. Mr. Lamont, who acted as recorder, and two natives at the reel. Leaving the channel we steamed out to the north of Hog Island, a long and narrow strip of land lying to the north of the Island of New Providence. Going a mile or two beyond land, we steamed into the wind with a velocity of about 5 to 6 knots an hour. The boat was small and somewhat top-heavy, and there was a considerable ground-swell; between the rolling and pitching of the boat and the resulting physiological effects it was with difficulty that we kept ourselves and the reel right side up. Barring a slight delay caused by the snapping, at the moment of ascent, of the small steel safety line attached to the kite, which had to be replaced by a piece of twine, there were no hitches or accidents. The kite rose swiftly and steadily to an elevation of about 4000 feet. With a vessel of greater speed we could doubtless have reached a higher elevation. The surface wind was about 12 miles per hour; to this we added about 5 miles, the speed of our launch. It seems doubtful from our experience during five ascents, whether it would be possible greatly to exceed this limit at this season

of the year without the aid of an artificial wind, even by means of additional kites. There is apparently a diminution of wind velocity above the elevation of about 4000 feet, in this respect differing from the conditions in the tem-

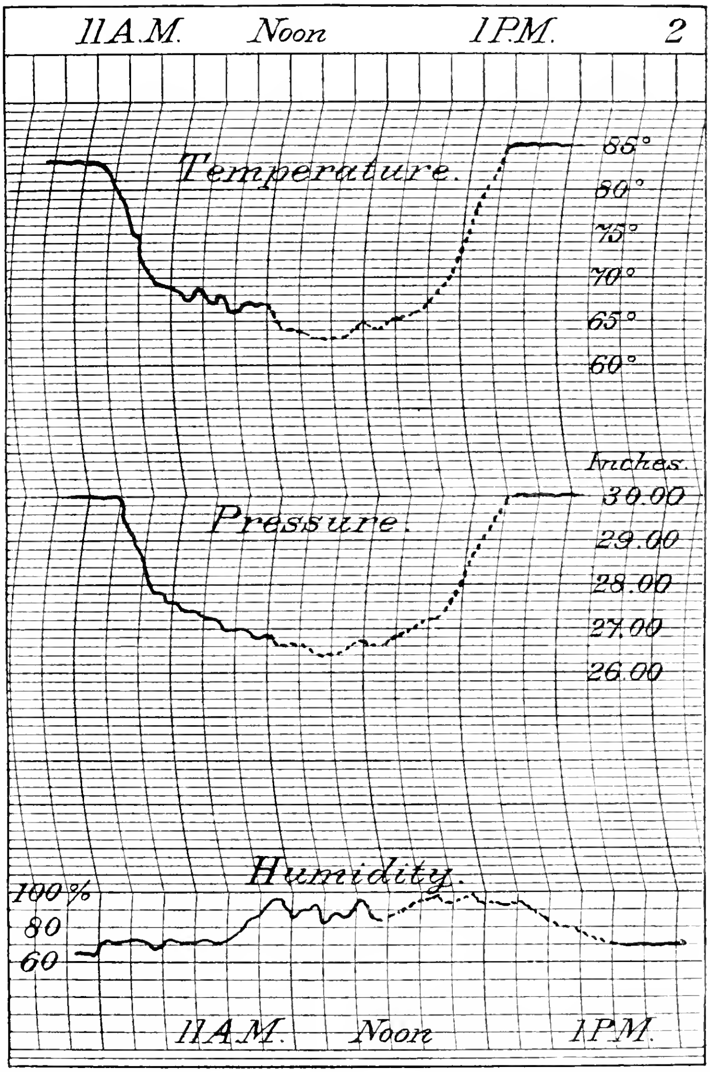


FIG. 4.—Nassau, Bahama Islands. Record made on board the steam launch *Alicia*. July 6, 1903, 11 a. m. to 1 p. m.

perate latitudes, where the velocity steadily increases up to the limits thus far attained. This supposition is also borne out by observations of the few upper clouds seen during our stay of five or six weeks in these latitudes. A few clouds of the upper layer were observed. but their slight northward motion

was to be detected only after the most careful observations by means of the nephoscope.

The lowest temperature recorded during the ascent of the 6th was 63°, with a surface temperature of 83°; the lowest barometric pressure was 26.40 inches, with a surface reading of 30.05 inches. The humidity ranged from 73 per cent at the surface to 98 per cent. A portion of the record was lost owing to the stopping of the clock a few minutes before the highest elevation was reached, but practically all the record during the ascending branch of the curve was intact. The kite left the boat at 11.10 a. m., reached its greatest elevation at 12.20 p. m., and was lowered at 1.12 p. m. The surface wind was east-southeast throughout, as during all preceding flights. The kite varied but little in azimuth from that of the surface wind; however, there was always a slight change to a more southerly direction of the wind in the region of the kite.

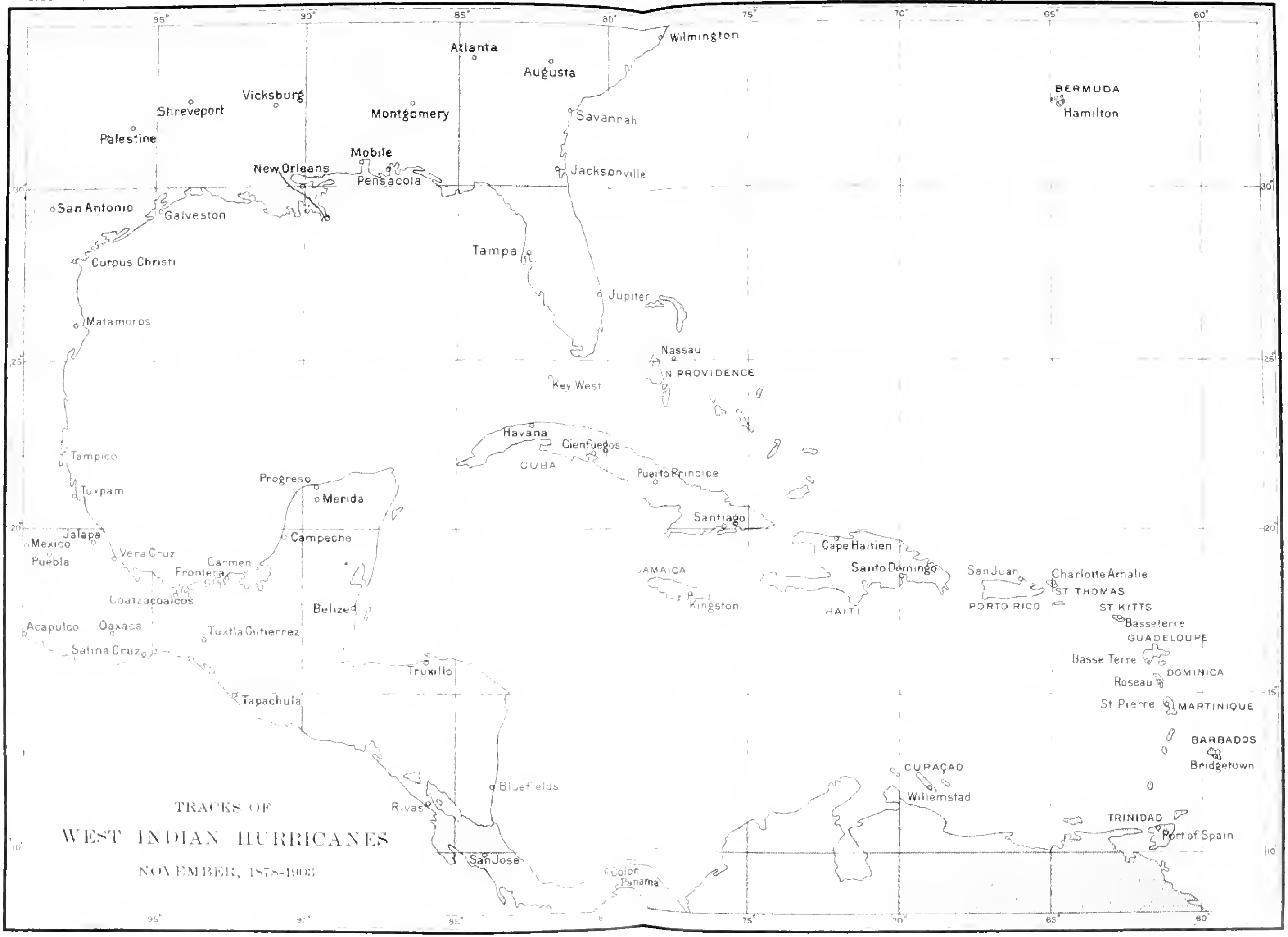
The east-southeast wind carried the kite beyond the limits of the Island in all but the first ascent. In the subsequent and higher elevations the kite was always a considerable distance beyond the coast line over the sea. In view of this fact and the small size of the Island, all of the observations may be regarded practically as ocean conditions, excepting those recorded within the first two or three hundred feet from the surface.

TEMPERATURE RESULTS.

The rates of decrease in temperature from the surface to an elevation of approximately 4000 feet are presented in tabular form, and charted in Figs. 5 and 6. Observations on the nephoscope for angular elevation of the kite, and readings of the dial on the reel for length of wire out, were made by Mr. Routh every five to ten minutes and sometimes more frequently. From these records and from the tracings of the kite meteorograph, averages were computed and plotted for each 100 feet and each 500 feet of elevation. The actual decrease in each 500 feet, the rate of decrease per 1000 feet, and the number of feet of elevation causing a decrease of 1° F. are shown in the following table:

TEMPERATURE DECREASE. AVERAGE OF FOUR ASCENTS AND SEVENTY OBSERVATIONS.

Elevation in feet	500	1000	1500	2000	2500	3000	3500	4000	Mean.
Departure from surface temperature, degrees	5	7	9	11	13	16	18	20	
Rate of decrease per 1000 feet, degrees	10.0	7.0	6.0	5.5	5.2	5.2	5.1	5.1	6.1
Number of feet per 1° decrease in temperature	100	143	167	182	192	192	196	196	164



TRACKS OF
WEST INDIAN HURRICANES
NOVEMBER, 1878-1903

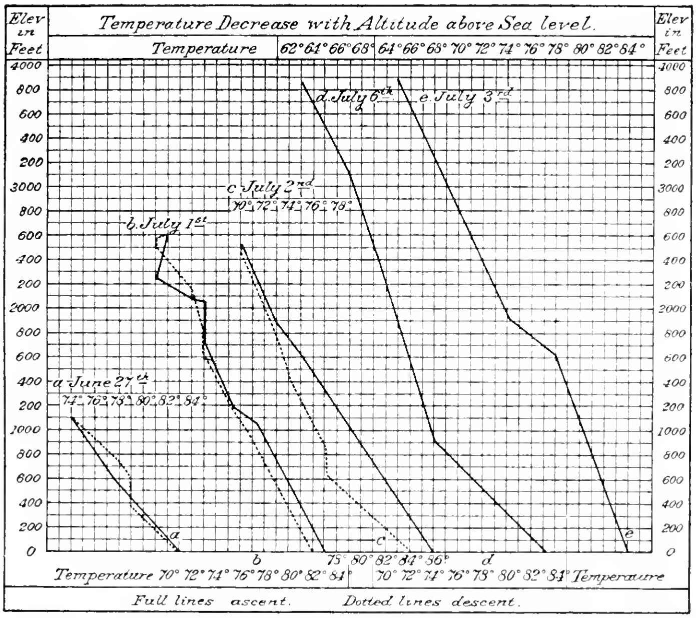


FIG. 5.—Nassau, Bahama Islands. Based on records of June 27 to July 6, 1903.

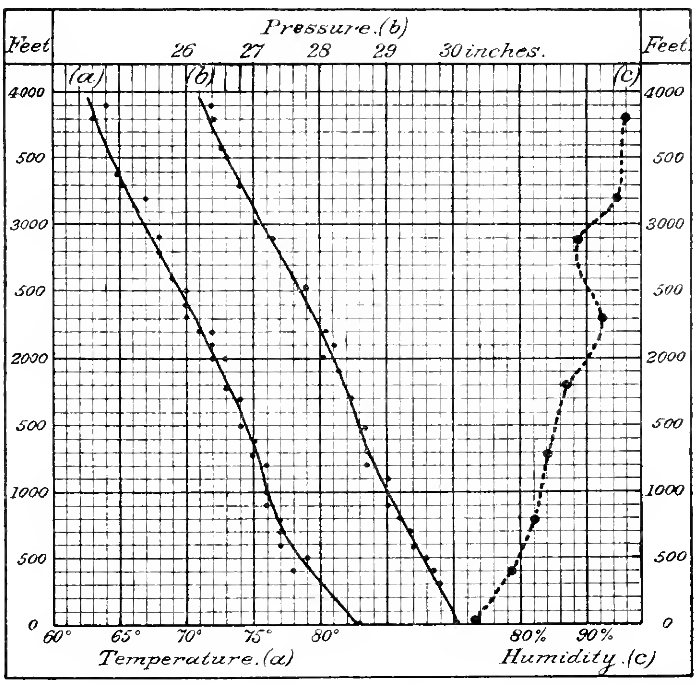


FIG. 6.—Nassau, Bahama Islands, June 27, July 1, 2, 6, 1903. Average values during four ascents.

Comparing these results with those obtained at other points under the auspices of the Weather Bureau in the summer of 1898 we find a close agreement. Practically all of the Nassau experiments were conducted in the afternoon. Taking from Bulletin F, of the Weather Bureau, the results of the Washington, D. C., afternoon observations and the mean of the afternoon observations at 17 localities in the United States, and placing them alongside the Nassau observations, the rate of decrease is seen to be almost identical.

COMPARATIVE RATE OF DECREASE IN TEMPERATURE PER 1000 FEET.

Elevation in feet.	Washington, p. m.	Mean of 17 localities in the United States, p. m.	Nassau, p. m.
	°	°	°
500	...	...	10.0
1000	8.1	7.5	7.0
1500	6.5	6.4	6.0
2000	5.8	6.0	5.5
2500	...	...	5.2
3000	5.5	5.5	5.2
3500	...	...	5.1
4000	4.9	4.9	5.1
Mean	6.2	6.1	6.1

The rate of decrease in temperature computed from averages for each 100 feet is also shown in Fig. 6 (*a*).

DECREASE IN PRESSURE.

As the altitude of the meteorograph is determined trigonometrically we may compute the average rate of decrease in pressure during four flights as shown in the following table, which also shows the number of observations employed and the average temperature of the air in each column of 1000 feet:

RATE OF DECREASE IN PRESSURE.

Altitude.	Number of observations.	Average temperature.	Fall of 0.1 inch.
Feet.		°	*Per feet.*
0-1000	16	80.4	95
1000-2000	25	78.3	103
2000-3000	26	69.8	109
3000-4000	7	64.6	105
Means.		73.3	103

In Fig. 6 (*b*) the rate of decrease in pressure is shown graphically. The plotted observations for which the curve is drawn are averages for each successive 100 feet. The total number of observations employed in the construction of the curve is about 75.

RELATIVE HUMIDITY.

Observations of relative humidity at the surface were obtained by means of a Richard hygrograph, checked by direct determinations of humidity by means of a sling psychrometer. The readings derived from the kite hygro-

graph tracings were averaged for each 100 feet of elevation, and these averages in turn grouped in order to obtain average values for each successive column of 500 feet. In the following table these values are reproduced; the average humidities are also shown graphically in curve (*c*) of Fig. 6.

As will be seen by inspection of the percentages of relative humidity, there is a steady increase from the surface to the highest elevations reached, namely 4000 feet, excepting the layer between 2500 feet and 3000 feet, where there is an interruption to the steady increase. The drop from 93 per cent to 89 per cent near the 3000-foot level is probably due to an excessive value just below the 2500-foot level, brought about by the kite passing through a cloud at this level on three or four occasions.

INCREASE OF RELATIVE HUMIDITY; AVERAGE OF FOUR ASCENTS.

Elevation.	Number of observations.	Relative humidity.	Elevation.	Number of observations.	Relative humidity.
Feet.		*Per cent.*	*Feet.*		*Per cent.*
Surface.	10	73	2500-3000	9	89
0-500	5	79	3000-3500	1	95
500-1000	12	82	3500-4000	2	96
1000-1500	15	84			
1500-2000	16	87		88	86.3
2000-2500	18	93			

TABULATION OF OBSERVATIONS.

The observations obtained during the various flights described above are tabulated below.

OBSERVATIONS AT NASSAU, JUNE 27, 1903.

Time.	Elevation of kite.	Atmospheric conditions.							Ascent for 0.1 inch of pressure decrease.	Ascent for 1° F. of temperature decrease.
		Surface.				At kite.				
		Pressure.	Temperature.	Humidity.	Wind direction and velocity.	Pressure.	Temperature.	Humidity.		
a. m.	*feet.*	*inches.*	°	%		*inches.*	°	%	*feet.*	*feet.*
*10.55	0	30.05	83	74	ese., 10	30.05	83	73	0	0
11.34	585	30.05	83	74	do	29.40	77	78	90	98
11.36	642	30.05	83	74	do	29.40	78	76	99	128
11.41	758	30.05	83	74	do	29.00	75	82	72	95
11.43	827	30.05	83	74	do	29.00	75	82	79	103
11.52	896	30.05	83	74	do	29.00	75	84	85	112
11.55	1089	30.05	83	74	do	28.80	74	85	87	131
Noon.	750	30.05	83	74	do	29.40	78	81	115	150
p. m.										
12.12	602	30.05	83	74	do	29.43	78	80	97	150
12.15	377	30.05	83	75	do	29.70	78	80	108	94
12.19	430	30.05	83	75	do	29.60	79	80	96	108
12.23	*372*	30.05	83	75	do	29.70	79	79	106	93
12.26	425	30.05	83	76	do	29.60	79	79	94	106
12.29	266	30.05	83	76	do	29.80	80	78	106	90
12.30	0	39.05	83	76	do	30.05	83	76	0	0

* 6 cumulus, 10 a. m. to noon. Average pressure decrease 0.10 inch per 95 feet. Average temperature decrease 1° F. per 112 feet. Figures in italic are interpolations.

OBSERVATIONS AT NASSAU, JULY 1, 1903.

Time.	Elevation of kite.	Atmospheric conditions.							Ascent for 0.1 inch of pressure decrease.	Ascent for 1° F. of temperature decrease.
		Surface.				At kite.				
		Pressure.	Temperature.	Humidity.	Wind direction and velocity.	Pressure.	Temperature.	Humidity.		
a. m.	*feet.*	*inches.*	°	%		*inches.*	°	%	*feet.*	*feet.*
10.00	0	30.05	83	75	ese., 15	30.05	83	75	0	0
10.12	1053	30.05	83	75	do	29.37	77	85	155	150
*10.20	1235	30.05	83	77	do	29.00	75	90	118	137
10.30	1711	30.05	83	77	do	28.60	73	94	118	156
†10.40	2066	30.05	83	67	do	28.40	73	97	125	188
10.50	2057	30.05	83	67	do	28.20	72	100	111	171
‡10.53	2112	30.05	83	67	do	28.10	71	100	108	162
§11.00	2280	30.05	83	72	do	27.80	69	100	101	152
11.10	2623	30.05	83	72	do	27.80	70	92	112	187
11.20	2382	30.05	83	72	do	27.80	70	90	106	170
11.32	2263	30.05	83	70	do	27.80	70	90	101	162
11.40	2476	30.05	83	70	do	27.98	72	82	120	206
p. m.										
12.04	1900?	30.03	83	75	do	28.20	73	90	104	173
12.23	2593	30.03	83	75	do	27.60	69	96	107	173
‖12.52	2334	30.03	83	75	do	27.83	70	99	106	167
¶1.05	2495	30.03	83	74	ese., 11	27.78	69	98	111	166
1.15	2440	30.03	83	74	do	28.00	71	90	120	188
1.25	1968	30.03	83	74	do	28.00	72	90	97	164
1.40	2281	30.03	83	74	do	27.90	71	93	107	175
2.00	1837	30.02	82	84	do	28.10	72	93	95	153
2.20	2176	30.02	82	84	do	28.10	72	87	113	181
**2.28	2024	30.02	82	78	do	28.10	72	90	105	184
2.40	2010	30.02	82	78	do	28.20	73	90	110	201
††2.49	2067	30.02	81	72	do	28.30	72	93	120	118
3.00	1812	30.02	81	72	do	28.30	73	85	105	201
3.10	2218	30.02	81	73	do	28.20	71	87	122	202
3.20	1840	30.02	81	73	do	28.58	73	87	112	204
3.40	1614	30.02	81	73	do	28.40	73	85	100	179
3.50	1165?	30.02	81	73	do	28.70	76	81	98	194
‡‡4.00	1230	30.02	82	77	do	28.70	75	75	93	154
§§4.05	1121	30.02	82	77	do	28.75	76	82	88	160
4.10	1298	30.02	82	79	do	28.62	75	82	93	162
4.15	1023?	30.02	82	79	do	28.80	76	75	85	148
4.20	1083	30.02	82	79	do	29.00	77	80	106	180
4.25	735	30.02	82	79	do	29.20	78	78	90	147
4.30	....	30.02	82	..	do	29.60	80	70	...	...
4 40	0	30.02	82	79	do	30.02	82	70	...	...

* 5 cumulus, 2 alto-cumulus. † Light scud under kite. ‡ Kite in cumulus at 10.57 a. m. § Light rain: kite in cumulo-nimbus. ‖ Kite in cumulus. ¶ Kite obscured by cumulus. ** Whole sky clouded in region of kite. †† Kite in cumulo-nimbus. ‡‡ Thunder at 4.05 p. m. §§ A few cirrus clouds apparently moving northward. Average pressure decrease 0.10 inch per 107 feet. Average temperature decrease 1° F. per 173 feet.

OBSERVATIONS AT NASSAU, JULY 2, 1903.

Time.	Elevation of kite.	Atmospheric conditions.							Ascent for 0.1 inch of pressure decrease.	Ascent for 1° F. of temperature decrease.
		Surface.				At kite.				
		Pressure.	Temperature.	Humidity.	Wind direction and velocity.	Pressure.	Temperature.	Humidity.		
p. m.	*feet.*	*inches.*	°	%		*inches.*	°	%	*feet.*	*feet.*
3.18	0	30.03	86	72	ese., 9½	30.03	86	72	0	0
3.42	1656	30.03	86	72	do	28.50	75	73	108	151
*3.52	1605	30.03	86	72	do	28.60	75	75	112	146
4.04	1872	30.03	85	73	do	28.40	73	76	115	156
4.14	2526	30.03	85	73	do	27.60	70	90	104	168
4.24	1643	30.03	85	73	do	28.40	74	90	95	149
4.32	1890	30.03	85	73	do	28.20	72	93	103	145
4.40	2455	30.02	85	74	do	27.80	70	95	111	164
4.50	1829	30.02	85	74	do	28.36	83	92	110	152
5.00	1473	30.02	85	75	do	28.60	74	90	104	134
5.10	1412	30.02	85	75	ese., 8	28.80	75	88	116	141
5.20	1318	30.02	85	75	do	28.65	75	90	96	132
†5.25	1831	30.02	85	75	do	28.20	72	87	101	141
5.30	1430	30.02	84	75	do	28.80	73	90	101	130
5.32	817	30.02	84	75	do	29.10	77	88	89	117
5.36	619	30.02	84	75	do	29.20	76	80	86	77
5.38	662	30.02	84	76	do	29.40	77	80	107	95
5.48	0	30.02	84	77	do	30.02	83	70	...	...

Clear day. * 4 cumulus from the southeast. † 3 cumulus from the southeast. Average pressure decrease 0.10 inch per 104 feet. Average temperature decrease 1° F. per 136 feet

OBSERVATIONS AT NASSAU, JULY 3, 1903.

p. m.	*feet.*	*inches.*	°	%		*inches.*	°	%	*feet.*	*feet.*
5.30?	0	30.03	83	63	ese., 12	30.00	83	..	..	..
5.36	....	30.03	83	63	do	29.65	81	62	..	..
5.41	1643	30.03	84	80	do	29.20	78	68	..	..
5.48	1910	30.03	83	80	do	28.60	74	80	..	.
*5.55	2068	30.03	83	80	do	....	..	..	..	..
†6.00	2305	30.03	83	77	do	....	..	..	..	..
6.11	3070	30.03	75	77	do	....	..	..	..	..
6.18	2825	30.03	75	77	do	....	..	..	..	..
‡6.21	3246	30.03	75	77	do	....	..	..	..	..
§6.27	3425	30.03	76	85	do	....	..	..	..	..
6.35	3184	30.03	76	85	do	....	..	..	..	..
‖6.47	*3207*	30.03	76	85	do	....	..	..	..	..
6.54	3674	30.03	76	85	do	....	..	..	..	..
7.00	3858	30.04	78	85	ese., 8	*26.30*	*65*	..	..	..
¶7.14	3856	30.04	78	85	do	....	..	..	..	..
7.30	2900	30.04	80	85	do	....	..	..	..	..
7.42	2237	30.04	80	85	do	....	..	..	..	..
7.50	2030	30.04	80	85	do	....	..	..	..	..
8.05	1040	30.04	79	85	do	....	..	..	..	..
8.15	957	30.04	79	85	do	....	..	..	..	..
8.20?	0	30.04	..	..	do	....	..	..	..	..

* Azimuth of kite changed from 100° to 110°. † Azimuth of kite returned to 100°. ‡ Kite entered cloud at 6.15 p. m. § Squall with rain, 6.20 p. m. ‖ 6 cumulus with occasional cumulus nimbus. § 6.44 kite in or over cumulus. ¶ Began to lower kite at 7.16 p. m. Figures in italic are interpolations.

OBSERVATIONS AT NASSAU, JULY 6, 1903.*

Time.	Elevation of kite.	Atmospheric conditions. Surface. Pressure.	Surface. Temperature.	Surface. Humidity.	Wind direction and velocity.	At kite. Pressure.	At kite. Temperature.	At kite. Humidity.	Ascent for 0.1 inch of pressure decrease.	Ascent for 1° F. of temperature decrease.
a. m.	*feet.*	*inches.*	°	%		*inches.*	°	%	*feet.*	*feet.*
11.10	0	30.05	83	73	ese., 12	30.05	83	73	0	0
11.20	904	30.05	83	73	do	28.60	74	85	62 ?	100 ?
11.25	2532	30.05	83	73	do	27.78	69	93	112	181
11.30	2825	30.05	83	73	do	27.52	69	90	112	200
11.35	2500 ?	30.05	83	73	do	27.40	68	90	94	167
†11.40	2792	30.05	83	73	do	27.20	68	80	98	186
‡11.45	2855	30.05	83	73	do	27.20	67	85	100	178
11.50	2925	30.05	83	73	do	26.90	66	90	93	172
11.55	3115	30.05	83	73	do	26.80	67	95	96	195
§Noon.	2875	30.05	83	73	do	*27.20*	*67*	. .	*101*	*184*
p. m.										
‖12.05	3564	30.05	83	73	do	*26.52*	*64*	. .	*101*	*184*
12.10	3455	30.05	83	73	do	*26.63*	*64*	. .	*101*	*184*
¶12.15	3600 ?	30.05	83	73	do	*26.49*	*63*	. .	*101*	*184*
12.20	3850	30.05	83	73	do	26.40	63	98	105	192
**12.25	3700	30.05	83	73	do	*26.45*	*63*	. .	*101*	*184*
12.30	3375	30.05	83	70	do	*26.71*	*65*	. .	*101*	*184*
12.35	3560	30.05	83	75	do	*26.53*	*64*	. .	*101*	*184*
12.40	3328	30.05	83	75	do	*26.76*	*65*	. .	*101*	*184*
12.45	3256	30.05	83	75	do	*26.83*	*65*	. .	*101*	*184*
12.50	2935	30.05	83	75	do	*27.14*	*67*	. .	*101*	*184*
12.55	2500	30.05	83	75	do	*27.58*	*69*	. .	*101*	*184*
1.00	1948	30.05	83	75	do	*28.12*	*72*	. .	*101*	*184*
1.05	905	30.05	83	75	do	*29.15*	*78*	. .	*101*	*184*
1.12	0	30.05	83	75	do	30.05	. .	. .	. . .	. . .

* On board steam launch *Alicia*; length 25 feet, width 8 feet, speed 5 knots. † 3 cumulus; wind from east; kite in cumulus cloud. ‡ Cumulus cloud passed over kite. § Kite in cloud. ‖ Kite in cloud. ¶ Kite entered cloud. ** Kite left cloud. Average pressure decrease 0.10 inch per 101 feet. Average temperature decrease 1° F. per 184 feet. Figures in italic are interpolations.

It may be of interest to record the relation existing between the length of wire out and the angular and vertical elevation of the kite. This relationship is shown in the following table, in which the average values for all observations of each flight are given:

RELATION BETWEEN LENGTH OF WIRE AND ELEVATION OF KITE.

Date.	Number of observations.	Average length of wire.	Average angular elevation.	Average elevation of kite.
		feet.	° ′	*feet.*
June 27	12	1081	38 0	637
July 1	34	3547	33 30	1869
July 2	16	2722	38 36	1565
July 3	18	3979	44 42	2635
July 6	22	4728	42 30	2865
June 27-July 6	102			
Means.		3211	39 28	1914

The average ratio of elevation to length of wire for all heights is a trifle less than 0.60. This value is based on 102 observations. The ratio varied but little throughout the experiments. The average ratio for 18 elevations exceeding 3000 feet was 0.59. The average angular elevation of the kite was 39° 28′ for all observations, and 38° 30′ for the 18 elevations exceeding 3000 feet.

SOILS OF THE BAHAMA ISLANDS

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BY

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INTRODUCTION.

A reconnoissance and survey of the soils of the Bahama Islands was undertaken during the summer of 1903, while the author was a member of the Expedition sent out to the Bahama Islands by the Geographical Society of Baltimore. In making this reconnoissance the field methods which have been elaborated by the U. S. Bureau of Soils were employed. The U. S. Department of Agriculture kindly provided a field outfit, including a portable laboratory. This was installed in a private residence at Nassau, and many important soil analyses were made in the field.

The area surveyed and mapped amounted in all to about 700 square miles, and included five islands and a few small cays, viz.: New Providence, Eleuthera, Cat, Long and Watlings Islands, and Rum Cay and the cays adjacent to New Providence and Eleuthera. The other islands visited were Andros and Great Abaco, but owing to lack of time no mapping was attempted. In carrying forward this work the author was assisted by Messrs. J. C. Britton and E. T. Hughes.

AGRICULTURAL DEVELOPMENT.

Practically nothing is known of the agriculture of the Lucayans, the aboriginal inhabitants of the Bahamas. Neither Columbus, upon his discovery, nor the Spaniards who visited the Islands later, recorded any of their observations upon agriculture as it then existed. Columbus, however, speaks of the inhabitants as a peaceful people, and their primitive weapons would also indicate that they were not of a warlike disposition. From this it might be inferred that they devoted themselves to agricultural pursuits. McKinnen, in his "Tour of the West Indies," says that he passed by "successive heaps of loose stones thrown together by the aborigines, who, it is supposed, had begun to cultivate the ground pretty extensively." They cultivated some species of grain, in all likelihood maize, and probably cotton also, for Colum-

bus mentioned some of their articles as made of cotton thread. He speaks, too, of orchards, but does not mention the kind of fruit.

In any event, their agriculture must have been of the very simplest kind. They were doubtless able to supply their wants easily, having the indigenous fruits of a subtropical region, in addition to what they produced. They were also able to supply themselves with fish, which were no doubt plentiful. Their only domesticated animal is said to have been a kind of dog, remarkable for the fact that it did not bark.

For over two hundred years after their discovery, agriculture cannot be said to have existed in the Islands. No stable government could be established during this period, as the Islands were the rendezvous of pirates. About 1670 the Bahamas were occupied by the English, and settlements were made soon thereafter, which remained permanent, though subjected to frequent Spanish attacks. It was not until about 1718, however, that the pirates were completely subdued. Following the restoration of order in the Islands settlers began to come in, among them some German refugees. These all turned their efforts to agriculture, and to the Germans is due the introduction of pineapples. From that time agriculture may be said to have begun its growth, and the foundations of commerce were laid. Development, however, was slow, for as late as 1770 only New Providence, Eleuthera and Harbor Islands were inhabited. These had a total population of a little over 3000, about one-third of which were negro slaves. By 1800 the town of Nassau alone had a population equal to this.

Agriculture received further impetus at the close of the Revolutionary War in America, when many of the fugitive Royalists from South Carolina and Georgia took refuge, first in east Florida, and finally in the Bahamas. These, like the earlier settlers, turned their attention to agriculture. They took up land, and finding it easily cleared, and apparently well suited to cotton, they began the cultivation of this crop on an extensive scale. It is said that fifteen years after their arrival 40 plantations, with between 2000 and 3000 acres in cotton fields, had been established on Crooked Island alone, and that on Long Island, which was settled at an earlier date, and which had been more extensively improved, there were in 1783 nearly 4000 acres in cultivation. The combined yield from Long Island and Exuma for one year was estimated at over 600 tons. The seed came chiefly from Georgia and was of the Persian variety. Later Anguilla cotton was introduced. The labor was performed by slaves. About five or six acres were allotted to each working

FIG. 1.—VIEW OF VEGETATION LOOKING NORTH FROM SUMMIT OF BLUE RIDGE, NEW PROVIDENCE

FIG. 2.—VIEW OF MATURE PINEAPPLE FIELD, NEW PROVIDENCE

VIEWS ILLUSTRATING AGRICULTURAL CONDITIONS

slave, and it was claimed that on some estates from one-half to three-fourths of a ton of clean lint was produced for each working slave, but McKinnen says that most planters were satisfied to get one-sixth of the latter quantity. The best cotton was grown on the higher lands. The cultivation of this crop, however, was not a permanent success, for McKinnen, who visited the Islands in 1802-03, says: "The plantations on Crooked Island for the most part were deserted, and the proprietors visited were generally in a state of despondency, from an agricultural point of view, as to the future." This probably was also true of all the other islands. The failure of cotton was due chiefly to the attacks of insects, but other causes were also operative. A committee of planters who investigated the problem at the time reported that besides the insects attacking cotton, the other causes that could be assigned for the failure of cotton growing were: the use of land unsuited to its culture, the injudicious and wasteful methods of clearing the land, and the exhaustion of the soil by unremitted tillage. Since that time the production of cotton has decreased, and upon the abolition of slavery in 1834 it ceased to be an important crop. At times, however, there has been a revival of the industry, and the production has temporarily increased. As late as 1898 the export of cotton was 10,782 pounds, valued at £143. Besides cotton, citrus and other fruits were produced.

According to McKinnen, "Guinea corn was universally cultivated, and was an agreeable and nutritious grain." He also states that the exports from the Islands included salt, turtles, mahogany, dye and other woods, and barks. It appears also from his report that the people were generally engaged in wrecking, as wrecks were numerous among the islands, and that the earnings from this source were considerable.

Slavery played an important part in the early agriculture of the Islands. This system was abolished in 1834, and the suddenness of the change left the agricultural industry of the Islands in a demoralized condition. The fine estates that had been built up were abandoned, the owners either moving to Nassau or leaving the Islands altogether.

Passing now to more recent developments in the agriculture of the Islands, pineapples have gradually increased in importance, becoming a staple product of export. Their production has increased until, in 1900, the exports amounted to 7,000,000 dozens. At one time the Bahamas enjoyed a monopoly of the pineapple trade with the United States, but in late years that position has been lost, owing partly to the strong competition of Jamaica, Cuba and Florida.

It is not known when the native stock was improved, or when citrus fruits were introduced, but they were grown by the earliest colonists, and by 1800 had become a rather important product. Their production was, however, seriously affected by the scale and other insect pests. Oranges were the first of these fruits to be exported, and at times have been shipped in large quantities, but in late years, owing to the American tariff and competition, the exports have fallen off. The groves have been neglected, and the production has become small indeed compared to what it formerly was.

Shaddocks or grape fruit have been produced for export, the latter becoming of increasing importance, as competition is less and prices such that the production is profitable even with the payment of tariff duties. Limes and lemons have never become of any importance for export.

Bananas have been exported to some extent, but these products cannot compete with those of Cuba and other countries having better shipping facilities. There are many other tropical fruits, but they have never become of commercial importance.

Sugar cane was introduced, but did not prove successful, and only small patches are now being grown. The canes are only used for home consumption, no sugar being made.

Tobacco was introduced, and was quite extensively cultivated during the seventies, with fair success. Cigars were first exported in 1878, but tobacco growing has now been discontinued.

Tomatoes were introduced in 1875, and in 1879, 8130 boxes were exported to the United States. Tomatoes are still grown universally, but not for export.

Sisal was introduced about 1850, but its value as a fiber plant did not receive recognition until some thirty years later. Samples of the fiber were sent to London, and were pronounced of superior quality. To further the industry a commission was sent by the Bahama government to Yucatan, where sisal growing had proved very profitable, to report upon the advisability of introducing the industry into the Bahamas. The commission reported favorably, considering the soil and climatic conditions of the Bahamas similar to those of Yucatan. Companies were organized by English capitalists in 1887 to grow sisal on an extensive scale, and plants of machinery for cleaning the fiber were installed. To foster the industry the Bahama Assembly passed two acts in 1889. One provided for a duty of 20 per cent ad valorem on all fiber imported, which had heretofore been in the free list. The second granted

a bounty of 1 cent a pound on all fiber produced for export during the following six years. The production therefore increased rapidly, until in the four years 1897 to 1900 the annual output reached over 1,000,000 pounds. During 1902 the output reached 2,345,311 pounds, with a value of £37,574.

Some effort was made a few years ago to introduce the growing of Manila fiber (*Musa textilus*), but without success.

During the Civil War in the United States the Islands became the depot for all cotton from the Southern States, and as a result were extremely prosperous. After the close of the war, however, business came to a standstill, and it may be said that only in recent years have the Islands begun to recover from the evil effects of the inflation of that period.

Thus, from the very first agriculture in the Bahamas has met with great obstacles. The colonists, disheartened by their reverses in the attempt to grow cotton, as already stated, deserted their plantations, leaving them to the slaves. Many left the Islands or devoted themselves to other pursuits. They finally had recourse to the sea. It was only natural, considering their surroundings, that this should be the case. Agriculture, with its attendant difficulties, offered nothing more than a mere living, while wrecking, fishing and sponging afforded remunerative employment and held out alluring prospects of occasional good fortune. Agriculture, however, was not given up entirely, but between voyages efforts were made to produce from the soil what little necessaries it afforded, and a great part of this work devolved upon the women and children. Agriculture thus became subordinated to the maritime pursuits, and still holds only a secondary place in the industries of the Islands.

CLIMATE.

As the Bahamas extend from 21° to 28° north latitude, they have practically a tropical climate. The range of temperature between the averages of the summer and the winter seasons is only about 10°, the average for summer being 82° F., and for winter 72° F. The extremes of temperature are about 16° above the average for summer and about 19° below the average for winter. Hence frosts are unknown.

The average annual rainfall is about 50 inches, ranging between a maximum of 91 inches and a minimum of 25 inches. It is, however, unequally distributed throughout the year, occurring chiefly during the summer, while in the winter long droughts are common. At times the precipitation is exceedingly heavy, and much damage is done to the crops. Often the dashing rains wash

away much of the light soils on the higher elevations. Heavy dews are common during the winter, and do much towards keeping up plant growth during the droughts. Cool winds from the northeast are common during the winter, and in August, September and October, destructive hurricanes may be expected. The prevailing winds are those of the "trades," which are generally easterly, varying to northeasterly and southeasterly. The Islands are so narrow that these winds greatly modify the climatic conditions. On account of their equable climate the Islands are growing in popularity as a winter resort.

GEOLOGY.

In their physiographic and geological features the Bahamas do not differ materially from one another. The topography consists in general of a range or series of ranges of low hills running lengthwise of the islands, with low intermediate valleys. The hills rise to elevations rarely exceeding 250 feet, and on the windward or northeastern side, which is commonly known as the "north shore," they consist of rounded dunes of loose, incoherent sand. Inland they become somewhat higher, are more stony and rugged, and often end on the leeward coast as low bluffs or promontories.

The valleys are but slightly elevated above sea-level, and the lower portions are often occupied by brackish ponds or lakes, the waters in many of which rise and fall with the tides, as they have subterranean connections with the sea. These valleys contain no running streams of fresh water, and surface drainage systems have not been established on any of the islands, with the exception of Andros. Even on this island the streams are few and small. The valleys, then, are not solution valleys, such as are found in limestone countries, but are original depressions between the ranges of hills or sand dunes. The drainage is therefore through the porous underlying rock, and through numerous fissures and crevices into the subterranean caverns, and thence through openings into the sea.

Along much of the windward shore, and in the bights on the leeward shore, occur beaches or narrow beach plains of sand, elevated a few feet above high water level, and varying in width from only a few yards to as much as half a mile.

The rock formation consists of shell and coral sand more or less solidified, to a limestone. By wave action the coral and shells have been pulverized and cast up on the beaches, where they have been picked up by the winds and blown inland, forming sand dunes. Later by infiltration of carbonate of lime,

the sands have been more or less cemented into a soft, porous rock. The formation, then, is found varying from the loose, incoherent sands of the beaches and sand dunes, to the older portions inland, composed of solid rock, fit for building purposes. The weathering of this coralline rock is mostly a chemical process. The rain water, with carbon dioxide in solution, dissolves out all the soluble portions, carrying them off in solution, while the more insoluble matter is left to form soil. This solubility, as with most limestones, is very great. It is estimated that at least 100 feet of the rock must be weathered to leave 1 foot of soil, and this without taking into account the forces of denudation.

Denudation of the little soil formed has been rapid, so that the underlying rock is exposed everywhere. The rock, upon exposure to the weather, becomes more or less indurated upon the surface, becoming so hard that when struck it gives a metallic ring. The effect of weathering on the rock varies, depending upon its position. In the low-lying or nearly level places, where water could stand, solution holes were started at the more soluble points, and the result has been the formation of innumerable pockets, giving the surface a truly honeycombed appearance. Most of these pockets are small, only a few inches in diameter, and as a rule not exceeding 18 inches in depth, but larger holes have been developed, either by solution or the falling in of the roofs of small caverns. These are spoken of as "banana-holes," as it is in these larger openings that bananas are planted.

The surface of the rock in these low grounds is ragged and very much pitted, making traveling difficult, and interfering with the cultivation of crops. Upon the hills and slopes, where the water drains off the surface readily, or filters through the underlying rock, the result of weathering has been somewhat different from that in the lowlands. The surface has not been eroded into pockets, but large, basin-shaped depressions have been formed, in which a black loamy soil has collected. Much of the rock is exposed, and having a flat surface, is spoken of as "plate rock," in distinction from that surface where pockets occur, which is known as "honeycomb rock." It is partly upon these surface characteristics that the different soils are popularly classified, and partly, also, upon the coppice growth.

SOIL TYPES.

As the geological formation and physiographic features of all the Islands are the same, a great diversity of soil types is not found. In all, seven types of soil are recognized as follows: Coral Sands, Bahama Black Loam, Bahama

Sandy Loam, Bahama Red Loam, Bahama Marl, Brackish Swamp, and Bahama White Marl. The extent and locations of six of these are shown on the accompanying colored maps. (Plates XXVIII to XXXII.)

The classification of the soil types is based mainly on differences in physical properties, as texture and color, but the physiographic position; characteristic natural vegetation, and agricultural value were also considered as factors in making the classification. Each type is essentially the same on all the islands where it is found, varying no more as between different islands than in different areas on the same island. The system of classification and nomenclature of soil types followed is that established and in use by the Bureau of Soils of the U. S. Department of Agriculture.

Accompanying the description of each soil type are mechanical and chemical analyses of typical samples. The mechanical analyses were made according to the procedure of the Bureau of Soils, U. S. Department of Agriculture. In the chemical analyses the method of the Association of Official Agricultural Chemists[1] was followed, only the more important plant-food constituents being determined. This method consists essentially of a digestion in hydrochloric acid of specific gravity 1.115 for ten hours at 100° C. The analyses of the water soluble salts was made by the methods in use by the Bureau of Soils.[2] In some cases considerable amounts of chlorides and sulphates were found to be present, and in such cases these constituents are stated as well as those which are generally held to be more important from the point of view of fertilizer practices. Two of the samples were so rich in

[1] Bull. No. 46, Div. of Chem., U. S. Dept. of Agric.

[2] Briefly, the method is as follows: 100 grams of the soil sample is stirred or shaken vigorously for three minutes with 500 cc. of distilled water and allowed to stand twenty minutes for the coarser soil particles to subside. The supernatant liquid, containing suspended clay and other solid matter, is decanted from the residue of heavier soil particles and filtered by means of a Chamberland-Pasteur, unglazed, porcelain filter fitted to the forced air device described by Briggs (Bull. No. 19, p. 31, Bureau of Soils, U. S. Dept. of Agric., 1902). The principal plant-food constituents in this aqueous extract are then determined colorimetrically, the nitrates by developing the yellow color resulting from the addition of phenol-disulphonic acid, making the solution slightly alkaline with ammonia, and then comparing with a standard solution of potassium nitrate similarly treated; the phosphoric acid by comparing the yellowish color produced by ammonium molybdate in nitric acid solution with a standard solution similarly prepared; the potassium by making the potassium platinic chloride, and then measuring the red color produced by an excess of potassium iodide against a standard solution of potassium platinic chloride similarly treated; the calcium by an adaptation of the well-known Clark soap method, modified by Winkler, Warthe, and others. For further details, see Appendix in Bulletin No. 22, Bureau of Soils, U. S. Dept. of Agric., 1903.

FIG. 1.—VIEW OF BANANA PALM IN BLOOM, NASSAU

FIG. 2.—VIEW OF COCOANUT GROVE, NASSAU

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soluble salts that an analysis was made by the method used for determining "alkali" in the soils of the United States. This method consists essentially in a gravimetric analysis of the constituents contained in an aqueous extract prepared by digesting the soil in ten times its weight of water.

Coral Sand.

The Coral Sand, or "white land," as it is popularly called, consists of sand of a whitish or grayish color. It is formed from the debris of the coral reefs and shells, ground to a sand of varying fineness by wave action, and afterwards carried inland from the beach by the winds. In general, the type is a loose, incoherent sand, but inland it becomes more loamy, approaching the texture of the black, loamy soils, into which it grades almost imperceptibly. The sandier phase contains very little organic matter, and allows water to pass through it very readily. It supports only a scant vegetation, consisting mostly of the sea-grape and other sand-loving plants. The more loamy phase approaches that of the older lands, and upon it grow grasses, forming good sod, particularly the Bermuda grass and a species of sand grass that thrives on the Islands.

The physiographic features consist of narrow coastal plains, or "double beaches," along much of the windward coast of the Islands, while back of these narrow strips is a range or series of ranges of sand dunes. These dunes vary in height from a few feet to 100 feet or more. The formation sometimes consists of a low ridge or bar between the sea and the brackish swamps along the coast. The largest development of this soil is on the north shore of Cat Island. It occurs also on all the other islands of the group. Where not too wet and salty it produces good crops of Indian corn, Guinea corn (the latter doing exceptionally well), Irish and sweet potatoes, cabbage, tomatoes and other products. Particularly are those situations good where the sand is somewhat more compact, or more clayey in lower depths, forming a more retentive subsoil. The cocoanut palm flourishes on this soil, provided it be fertilized and the trees properly cared for. It is particularly important on a soil of this texture to mulch the trees with leaves, grass or other refuse as far as possible to conserve the moisture about the roots. At Nassau good results have been obtained by using street sweepings as a fertilizer. On Cat Island are areas of this type covered by grasses which have formed a firm sod, affording good pasturage to live stock, which seemed to be doing well. The more extended use of the soil-binding grasses would greatly improve the agricultural conditions on this type.

In the past this soil has not been considered of importance, but it is now being used quite generally for vegetables, and in time will probably be considered one of the most valuable soil types. Its position on the coast, where the products can be easily taken on boats, is an advantage, although on the other hand the crops are more likely to be damaged during hurricanes. It has a further advantage in that it is not stony, and can be easily worked. If desired, improved implements can be used.

The mechanical analyses of two typical samples of this soil follow in the subjoined table:

MECHANICAL ANALYSES OF CORAL SAND.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.
9390	Mangrove Cay, Andros.	White coral sand 0 to 12 inches.	11.73	4.82	36.88	18.74	27.12	3.66	3.08	5.60
9403	North Shore, Cat Island.	White coral sand 0 to 12 inches.	10.18	7.98	11.34	23.30	15.90	1.28	3.54	3.48

It will be seen from the above table that about four-fifths of the soil is composed of coarse sands, with less amounts of medium and fine sands, and about 4 per cent of clay. It will be noticed, too, that the organic matter is high as compared with that of other soils. It may be said that this organic matter is not apparent in the field, and no doubt comes from the animal remains in the minute shells which are so numerous in the soil. The chemical analysis of a composite sample of this soil type shows the following results:

PRINCIPAL PLANT FOOD CONSTITUENTS IN CORAL SAND.

By acid digestion (HCl sp. gr. 1.115).

Constituent.	Per cent.
Phosphoric acid (P_2O_5)	.076
Lime (CaO)	50.810
Potash (K_2O)	.306
Nitrogen (N)	.127

Besides the large amount of lime, the most striking feature presented by the above figures is the small amount of nitrogen (.127 per cent) in comparison with the large content of organic matter (10.5 to 12 per cent). The percentages of potash and phosphoric acid compare favorably with those usually found in productive continental soils.

PRINCIPAL CONSTITUENTS IN WATER SOLUBLE SALTS FROM CORAL SAND.
(1 part soil to 5 parts water.)

Sample number.	Location.	Crop conditions, etc.	Parts per million of air-dried soil.					
			Potassium K.	Calcium Ca.	Nitrate NO_3.	Phosphate PO_4.	Chloride Cl.	Sulphate SO_4.
9390	Mangrove Cay, Andros.	0-15 in. Vegetable garden. Considered good. Fresh water which rises and falls with tide, said to be reached 24 in. beneath surface.	17.4	9.2	13.7	13.1	7.0	Tr.
9403	North Shore, Cat Island.	Sand. 0-12 in. From narrow coastal plain. Garden truck growing on it.	28.7	12.8	3.2	17.2	21.0	Tr.
8	Nassau, New Providence.	Sisal will not grow.	90.3	140.4	31.1	17.5	...	...
15	Mangrove Cay, Andros.	In corn, potatoes, tomatoes, etc. Considered good field.	147.6	199.8	11.2	13.6	....	....

NOTE.—Analyses of samples Nos. 8 and 15 were made on fresh soil in the field, while those of Nos. 9390 and 9403 were made in the laboratory, several months later, on air-dry samples.

The above results show that these soils are amply supplied with soluble phosphates as compared with the soils of the Eastern United States. The amounts of chlorides indicated by the two cases in which this substance was sought are somewhat larger than is usually found in the soils of humid continental areas, but not large enough to be considered as seriously detrimental. The amounts of potassium are large in samples Nos. 8 and 15, which were examined almost immediately after being taken from the field, but in samples Nos. 9390 and 9403, which were not examined until after they had become air-dry, are about normal as compared with continental soils. A large amount of water soluble potassium seems to be characteristic of tropical island soils and has generally been observed in soils from other localities than the Bahamas. The discrepancy between the amounts of nitrates in the fresh and the dried samples is apparently also characteristic, and *in situ* this soil is probably very abundantly supplied with this important plant-food constituent.

BAHAMA BLACK LOAM.

The Bahama Black Loam, or "provision" land, as it is locally known, varies from a loose brown to a jet-black loam. The typical soil consists of rounded grains of coral sand with a large percentage of organic matter. A phase of this type is considerably more sandy, consisting of disintegrated rock

and wind-blown sand, and containing less organic matter. This soil is quite shallow, generally only a few inches deep, except where there has been special opportunity for accumulation.

The Bahama Black Loam is the principal type on all the islands, occupying approximately three-fourths of their area, while some of the smaller islands are almost entirely covered by it. It covers the hills of the interior and the slopes leading to the coast, where it passes into the Coral Sand. Where the coast is abrupt it extends to the edge of the cliffs. It occupies, therefore, the rougher portions of the surface. The rock outcrop is prominent; in fact, the exposed rock forms the greater part of the surface, the soil filling the depressions in the weathered rock and between the exposed boulders. Its elevated position gives it perfect drainage, the water either flowing from the surface, or, as is most common, filtering easily through the shallow soil into the underlying porous rock. The loss of moisture by evaporation is also great, so that the soil is subject to drought, rarely keeping in a moist condition long at a time, where crops requiring clean cultivation are grown. The use of cover crops, or mulches, particularly at dry periods, would do much to conserve the soil moisture. However, considering its shallowness, the soil retains moisture fairly well, owing to its large content of organic matter.

This soil occurs where the rock has weathered, leaving the surface in the condition known as "plate rock," that is, where the surface of the underlying rock is flat, or nearly so. Where this plate rock occupies a low position, the land is known as "plate-rock scrub," but the soil differs little from that on higher elevations. Brackish ponds are numerous in the lower areas, and probably the soil is not quite so good for crops because of the nearness of the underlying salt water.

This soil is mostly of residual origin, being derived from the weathering of the underlying coralline rock. The process has been largely one of solution, the residue being small in amount and consequently the resulting soil formation slow. The wind has also assisted in forming this soil, by carrying the sand from the beaches inland, where it has fallen into the depressions and pockets in the rock. Vegetation has sprung up, and by its decay a loamy soil has gradually formed, until finally a heavier plant growth could be supported. The depth of the soil is dependent upon the depth of the pocket or depression where it occurs. Usually these depressions are shallow and basin-shaped, rarely exceeding one foot in depth. In the larger solution holes, known as "banana holes," the Bahama Black Loam has been washed in until it has a

considerable depth. Occasionally, in the lower situations, where the soil has evidently been washed from higher ground, it is found to be a foot or more in depth, and free from stones. The stony character of the soil makes cultivation difficult. No improved implements can be used, and the spade and hoe are the only ones that can be employed to advantage.

This type is used mostly for the production of the subsistence crops; hence the popular name of "provision land." Upon it are grown the vegetables and fruits which form the food of the people, and also constitute some of the exports. These consist of potatoes, sweet cassava, onions and other vegetables, citrus and other fruits, including shaddocks (grape fruit) and oranges. Indian corn is also grown in small quantities. To all of these crops the soil is well adapted, except in the dryer situations.

This soil is considered the best type on the Islands for the production of citrus fruits, and it is upon this that the industry has been developed. Since the growing of oranges has been partly abandoned, the grape fruit has taken the lead among the citrus fruits. All the fruits are of excellent quality, considering the varieties grown.

The sisal fiber industry was also developed on this soil type. The sisal plant does well where any care at all is given to its cultivation, except in low-lying or wet areas. Large areas of this land were cleared for the production of this crop, and sisal plantations of several thousand acres in extent are to be seen.

Cotton grows luxuriantly in this soil, and upon this Black Loam it was cultivated in the early days. The plant grows treelike, and pruning is necessary to keep it within reach and to make it bear. The life of the plant extends over several seasons.

All other plants grow luxuriantly upon the Bahama Black Loam, and especially in the virgin soil. The coppice is large and thick, and the land is often called "big coppice land," to distinguish it from types supporting less vigorous growths. Although at first productive, the yields soon decrease, possibly from a lack of sufficient soil to support crops continuously. Just as soon as cultivation is discontinued, the land reverts to natural coppice growth, which attains a height of 15 to 20 feet. The larger growth consists of lignum vitæ, mahogany, mastic, logwood and some other trees and bushes.

This soil has an excellent texture, and the only hindrance to its cultivation is the existence of the rock outcrops. Because of its stony nature and difficult cultivation, it is best adapted to orchard fruits. These do best where

holes for the trees are blasted and filled in with soil. The use of thick cover crops, grown in the latter part of the wet season, and cut and left on the ground for a mulch, is recommended, as tending to conserve the moisture through the dry season. The use of seaweed or any other refuse would be beneficial to this soil, particularly as a mulch. Very little fertilizer of any kind is used in the growing of cultivated crops on this soil. The greater part of this type is allowed to remain in the native coppice growth.

The mechanical analyses of three samples of this soil are given in the table below:

MECHANICAL ANALYSES OF BAHAMA BLACK LOAM.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.
9393	Current Settlement Eleuthera.	Black loam 0 to 4 inches.	10.11	1.90	15 46	17.60	28.38	7.80	15.36	13.24
9399	Tarpum Bay, Eleuthera.	Loose black loam 0 to 3 inches.	32.02	2.16	10.76	15.74	37.84	11.04	16.10	5.92
9405	Bight Settlement, Cat Island.	Loose black loam 0 to 6 inches.	22.97	1.21	4.66	4.91	23.62	11.40	32.52	21.56

The above analyses show the soil to be composed of about two-thirds sand, with the remainder consisting of a little more silt than clay particles. The organic matter content is extremely high, as would be expected.

The chemical analysis of a composite sample of this soil type is given in the following table:

PRINCIPAL PLANT FOOD CONSTITUENTS IN BAHAMA BLACK LOAM.

By acid digestion (HCl sp. gr. 1.115.).

Constituent.	Per cent.
Phosphoric acid (P_2O_5)	.085
Lime (CaO)	.790
Potash (K_2O)	.725
Nitrogen (N)	.341

This soil would seem to be amply supplied with phosphoric acid, and to contain unusually abundant amounts of the other desirable constituents as compared with continental soils.

FIG. 1.—VIEW OF PINES BARRENS, NEW PROVIDENCE

FIG. 2.—VIEW OF JUNGLE GROWTH, NEW PROVIDENCE

VIEWS ILLUSTRATING AGRICULTURAL CONDITIONS

PRINCIPAL CONSTITUENTS IN WATER-SOLUBLE SALTS FROM BAHAMA BLACK LOAM.

(1 part soil to 5 parts water.)

Sample number.	Location.	Crop conditions, etc.	Parts per million of air-dried soil.					
			Potassium K.	Calcium Ca.	Nitrate NO_3.	Phosphate PO_4.	Chloride Cl.	Sulphate SO_4.
9405	Bight Settlement, Cat Island.	Loose black loam, 0-6 in., taken on a ridge. Sisal growing and doing well.	139.2	111.1	2.1	18.3	503.0	61.7
9393	Current Settlement, Eleuthera.	Fine black loam 0-4 in. Orange orchard. Land is droughty.	14.1	29.2	19.0	15.8	21.0	Tr.
9399	Tarpum Bay, Eleuthera.	Loose black loam 0-3 in. Taken in a shallow basin. Heavy bush growth.	14.3	30.0	5.2	20.8	49.0	Tr.
3	Orange Hill, New Providence.	Grape fruit orchard. Good condition.	203.1	259.0	231.6	16.5	....	....
4	Near Lake Cunningham, New Providence.	Small valley; deep soil, washed from higher elevation; used as vegetable garden.	161.5	116.0	153.7	17.7	....	....
11	Nassau, New Providence.	Black loamy soil from banana hole.	93.8	227.0	61.8	22.7	....	....

NOTE.—Analyses of samples Nos. 3, 4 and 11 were made on fresh soil in the field, while those of Nos. 9405, 9393 and 9399 were made in the laboratory, several months later, on air-dry samples.

From the above figures it would seem that the type is very rich in water-soluble (and therefore readily available), mineral plant-foods. The phosphates in both fresh and air-dried samples are quite high, as is the potassium with one exception. The soil is also very rich in nitrates, the two low figures from air-dried samples having probably no significance as to the conditions *in situ*. There are indications, however, that in places the soil might contain injurious amounts of soluble chlorides, although not in quantities which could not be readily removed by draining.

BAHAMA STONY LOAM.

The Bahama Stony Loam, or "pine-barren land," was mapped only on New Providence, and was found to cover nearly three-fourths of that island. The type is really a variation of the Bahama Black Loam, but because of its extensive area, its different vegetation and physiographic features, and the general condition of the soil, it has been regarded as a separate type. The soil consists of a very large proportion of rock fragments, with fine earth in

the interstices, being similar in appearance to that of the black or "provision" land, and consisting of a brown to blackish loam. Laboratory analysis also shows its texture and organic matter content to be about the same.

The pine-barren land occupies low, level positions, becoming swampy in the lower places in wet seasons. The underlying rock has weathered in the manner characteristic of low areas generally. The pockets are not so deep as in the areas of scrub land, and the intervening partitions are thinner, and more or less broken down, causing the irregular-shaped fragments to fill the pockets and give a large percentage of stony material. The surface of the intervening ledges is very ragged. Disintegration, as well as solution, has been an important factor in the formation of this soil.

Besides the large area on New Providence, the pine-barren land occupies large areas on Andros and Abaco Islands. But as these islands were not mapped the exact extent of the type is not known. The characteristic vegetation is pine. The trees, which as a rule do not exceed 8 inches in diameter, seldom rise to a height of more than 35 feet.

On the wetter areas the scrub palmetto grows, and on some of the higher and better drained portions, where the proportion of rock fragments is less and the soil is more like Bahama Black Loam, there is a fair coppice growth. Where fires are not allowed to burn over the barrens there is an undergrowth of low, scrubby bushes, ferns and sedges.

Agriculturally the pine-barren land is of little value. Some use is made of the small pine timber, and quantities of charcoal are burned. Formerly some turpentine was obtained from these trees. At one time it was thought the pine-barren land would be suitable for the growing of sisal, but the soil proved but poorly adapted to this crop.

The mechanical analysis of the fine earth of this soil type is given in the subjoined table:

MECHANICAL ANALYSES OF BAHAMA STONY LOAM.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.
9415	Abaco Island.	Dark brown loam 0 to 4 inches.	21.54	4.26	12.74	7.30	17.20	24.82	24.30	9.22

PRINCIPAL CONSTITUENTS IN WATER-SOLUBLE SALTS FROM BAHAMA STONY LOAM.

(1 part soil to 5 parts water.)

Sample Number.	Location.	Crop Conditions, etc.	Parts per million of air-dried soil.					
			Potassium K.	Calcium Ca.	Nitrate NO_3.	Phosphate PO_4.	Chloride Cl.	Sulphate SO_4.
9415	Abaco.	Black loam, 0-4 in., with large percentage of rock fragments. In sisal, not doing well.	180.8	31.4	31.6	14.2	650.8	83.5
16	New Providence.	Thin pine forest.	107.4	209.8	278.3	32.8	....	....

NOTE.—Analysis of sample No. 16 was made on fresh soil in the field, while that of sample No. 9415 was made in the laboratory, several months later, on an air-dry sample.

These figures show that this type of soil contains very large amounts of the most important mineral plant-food constituents, readily soluble in water. In fact, the amount of readily soluble material is probably sufficient to prove positively injurious to ordinary crops, and it seems not improbable that the unproductiveness of the type is chiefly due to this cause.

BAHAMA RED LOAM.

The Bahama Red Loam, locally called "red land," or "pineapple land," although it does not cover so large an area as the Bahama Black Loam, is the most important soil of the Islands, being very productive and durable. It consists of a red loam or red clay loam, sometimes even approaching a clay in texture. It is generally deeper than the other residual soils of the Islands.

It occurs usually as small areas—often too small to be shown on the map—in the Bahama Black Loam. These, as a rule, occupy the level hilltops or the lower slopes of hills, and often, as is the case on Watlings Island, the soil has been deposited in the small lakes or ponds, showing that the formation is often the drift or wash from higher surrounding lands. On Eleuthera and Cat Islands, however, the areas are large, the topography being the same as that of the Bahama Black Loam. Eleuthera has a relatively greater proportion of this soil than the other islands. On these two islands this soil is of the greatest importance, for upon it has been developed the large pineapple interests. On the other islands, where it occurs at all, the extent is so small that it is of no importance. This land is never allowed to remain idle, as long as it continues productive.

Its origin is not certain, but it is probably the oldest soil of the Islands, being the product of a further decomposition of the black soil. Gradations can be found which support this view. The position of areas of this type, as a rule, is such that it is not subjected to surface washing; hence, the soil materials have a chance to accumulate and to weather more thoroughly, and the soil formed is similar to the limestone soils of the Valley of Virginia in the United States.

The soil occurs mostly where the rock surface is honeycombed. In such places the weathering has been similar to that in the low-lying areas, but it has gone further, and the pockets are deeper and filled with soil. Often small areas, free from rock fragments and outcrops, occur, but in general this type is very stony and difficult to cultivate.

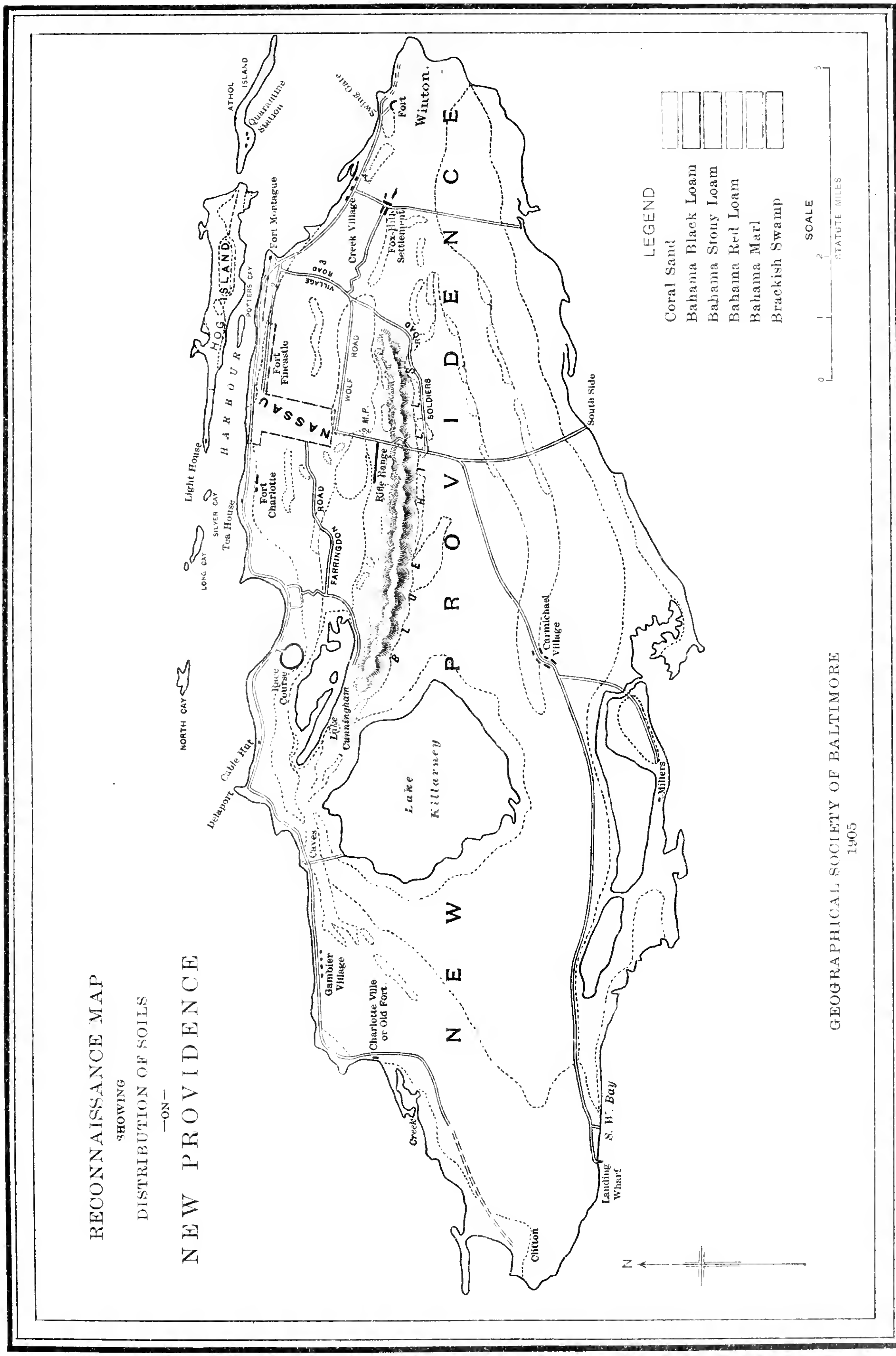
Another hypothesis, however, has been advanced, according to which this soil type is a sediment of red clay deposited on the ocean floor, which has been brought above the surface upon the elevation of the Islands.

In consequence of its peculiar fitness for the production of pineapples, the value of this soil is high. It is at present used entirely for the cultivation of this crop, but would produce equally well all other products that need a heavy soil. The acreage under pineapples is quite large. The industry is centered on those islands having the largest extent of this soil, viz.: Eleuthera and Cat Islands. The former is the more important.

Some idea of the importance of the pineapple industry on this soil can be gained by an examination of the statistics of exports. The figures have ranged from 400,000 to 600,000 dozens in recent years, while in 1900 the exports to the United States were 7,233,012 dozens, valued at £59,191.

The pineapple lands have not their former productiveness, and the yields are gradually decreasing. Large quantities of high-grade fertilizers are used, forcing the productive power of the soil, but after a few seasons it fails to respond to this stimulus, and is then thrown out of cultivation, and soon reverts to the native coppice growth. After 15 or 20 years, however, it can be cleared again, and the same process repeated, the soil recuperating while in bush.

In view of these facts, it would seem desirable to investigate the possibility of finding a crop rotation for this soil. The analysis which will presently be given indicates no lack of mineral plant food in this soil in readily available form, and it is an interesting and important economic question whether the artificial stimulation of the pineapple by commercial fertilizers


RECONNAISSANCE MAP
SHOWING
DISTRIBUTION OF SOILS
—ON—
NEW PROVIDENCE
LEGEND
Coral Sand
Bahama Black Loam
Bahama Stony Loam
Bahama Red Loam
Bahama Marl
Brackish Swamp
SCALE
0 1 2 3
STATUTE MILES
GEOGRAPHICAL SOCIETY OF BALTIMORE
1905
N
NEW PROVIDENCE
NASSAU
HOG ISLAND
HARBOUR
ATHOL ISLAND
Quarantine Station
Swing Gate
Fort Winton
Fort Montague
Creek Village
Fox Hill Settlement
VILLAGE ROAD
POTTERS CAY
Fort Fincastle
WOLF ROAD
SOLDIERS ROAD
BLUE HILLS
Light House
SILVER CAY
Tea House
LONG CAY
Fort Charlotte
Rifle Range
FARRINGDON ROAD
South Side
Carmichael Village
NORTH CAY
Race Course
Lake Cunningham
Lake Killarney
Cable Hut
Delaport
Caves
Millers
Gambier Village
Charlotte Ville or Old Fort
Creek
S. W. Bay
Landing Wharf
Clifton

could not better be replaced by a more diversified system of cropping, in which the pineapple would be cultivated in a rotation of several years. With such a system, and in view of the large quantities of soluble mineral matter found in the soil, a much reduced application of fertilizers would probably be required. This subject is certainly worthy of an experimental investigation on this type of soil, and perhaps also on other types.

While the soil is naturally retentive of moisture, it suffers from drought during prolonged dry periods. This is principally due to the comparatively shallow soil and the presence of porous rock beneath. Every precaution should be taken to conserve the soil moisture. The coppice growth is heavy, and similar to that on the Bahama Black Loam.

Mechanical analyses of typical samples from the different islands are given in the table below:

MECHANICAL ANALYSES OF BAHAMA RED LOAM.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.
9392	Bluff Settlement, Eleuthera.	Dark red loam 0 to 8 inches.	8.18	3.00	15.40	10.82	22.80	10.80	19.00	18.04
9396	Gregory Town, Eleuthera.	Dark reddish brown loam or clay loam 0 to 10 inches.	8.06	1.66	9.36	11.44	20.84	7.98	18.02	30.64
9397	Gregory Town, Eleuthera.	Heavy loam or clay loam 0 to 8 inches.	4.95	2.20	6.28	6.76	22.10	11.24	19.90	31.52
9398	Governor's Harbor, Eleuthera.	Heavy loam to clay loam 0 to 6 inches.	5.16	0.86	5.38	6.42	20.52	10.68	22.52	33.52
9404	Bight Settlement, Cat Island.	Red clay loam 0 to 12 inches.	2.60	0.60	5.00	7.48	23.84	15.90	22.14	24.78
9407	Bailey Town, Cat Island.	Heavy loam to clay loam 0 to 8 inches.	6.05	1.92	10.16	9.98	20.50	11.50	17.28	28.66
9410	Bailey Town, Cat Island.	Loam to clay loam 0 to 8 inches.	1.30	3.06	12.66	10.20	17.70	10.04	20.96	25.30
9412	Watlings Island.	Loam to clay loam 0 to 8 inches.	5.62	1.60	6.82	7.78	14.98	10.22	34.92	23.64

The texture, as shown in the above table, is very similar to that of the lighter limestone soils of the United States. The Bahama soil is, however, as a rule, more loamy, but after it has been worked for some time it becomes compact, and the surface cracks upon drying. The introduction of more organic matter, as by green manuring, would probably be found beneficial and ultimately profitable.

The following chemical analysis was made from a composite sample from all the islands:

PRINCIPAL PLANT FOOD CONSTITUENTS IN BAHAMA RED LOAM.

By acid digestion (HCl sp. gr. 1.115).

Constituent	Per Cent.
Phosphoric acid (P_2O_5)	.165
Lime (CaO)	6.380
Potash (K_2O)	.418
Nitrogen (N)	.043

These figures indicate a satisfactory reserve supply of phosphoric acid and potash in this type of soil, and, of course, an ample amount of lime. The amount of nitrogen is a fairly satisfactory one.

PRINCIPAL CONSTITUENTS IN WATER-SOLUBLE SALTS FROM BAHAMA RED LOAM.

(1 part soil to 5 parts water.)

Sample number.	Location.	Crop conditions, etc.	Parts per million of air-dried soil.					
			Potassium K.	Calcium Ca.	Nitrate NO_3.	Phosphate PO_4.	Chloride Cl.	Sulphate SO_4.
9396	Gregory Town, Eleuthera.	Reddish brown heavy loam 0 to 10 in. Slight depression on upland. In pineapples and doing well. Fertilized.	23.2	17.8	26.3	13.7	17.6	Tr.
9397	Gregory Town, Eleuthera.	Heavy loam to clay loam 0 to 8 in. from upland. Pineapples—excellent growth and productive. Highly fertilized.	17.4	9.2	4.2	15.8	14.0	Tr.
9398	Governors Harbor, Eleuthera.	Loam 0 to 6 in. Pineapple field—productive. Highly fertilized.	130.2	42.1	2.6	11.2	151.8	Tr.
9404	Bight Settlement, Cat Island.	Heavy loam or clay loam 0 to 12 in. Soil deeper than common. Sisal doing well.	21.2	13.5	1.6	11.4	42.0	Tr.
9406	Columbus Bluff, Cat Island.	Pineapple, doing well. Fertilized.	71.7	129.3	....	....	....	....
9410	Bailey Town, Cat Island.	Heavy loam or clay loam 0 to 8 in. Pineapples. Fertilized.	90.4	64.4	6.3	14.8	225.1	36.0
9412	Watlings Island.	Heavy red loam or clay loam 0 to 8 in. Covered by bush.	10.9	15.7	10.6	13.1	7.0	11.5
1	Near Orange Hill, New Providence	Pineapples. Good.	176.2	146.7	91.7	4.2	....	....
2	Near Lake Killarney, New Providence	Pineapples. Good.	210.6	76.8	76.8	6.2	....	...
5	Near Lake Cunningham, New Providence.	Pineapples, not doing well.	176.4	92.3	27.5	16.5	....	...
6	Near Lake Cunningham, New Providence.	Same field, but where pineapples were doing well.	207.3	173.4	33.8	3.5	....	....
7	Near Lake Cunningham, New Providence.	Do.	238.2	225.8	55.8	6.2	....	....
10	Near Nassau, New Providence	Newly cleared field.	109. 0	159.7	72.7	15.1	....	....
12	Near Nassau, New Providence.	Pineapple field. Good.	97.5	252.9	29.9	19.1	....	....

NOTE.—Analyses of samples ranging from Nos. 1 to 12 were made on fresh soil in the field, while those numbered above 9000 were made in the laboratory, several months later, on air-dry samples.

The above figures show considerable variations in the case of every constituent. In no case, however, are they lower than figures which have been obtained for soils in the United States of known high productiveness. How far these variations in the figures may be due to artificial fertilizing, it is impossible to say, although it is probable that they are mainly due to this cause. One might *a priori* have expected a nearer approach to uniformity in this soil, in virgin condition, than in any other type occurring in the Islands. There is a warning indicated in the chlorine figures, either that excessive fertilization is being practiced or that drainage may, in some localities, be desirable.

Bahama Marl.

The Bahama Marl, or "scrub land," sometimes known also as "light" or "small" "bush land," has recently come into prominence as a possible rival of the Bahama Red Loam in the production of pineapples. This type occurs as lowlands but little above high water level. The areas are closely associated with the brackish swamps. They are sufficiently elevated to avoid swampy conditions, and yet low enough so that good moisture conditions always prevail. In fact, the soil never becomes dry in the bottom of the pockets.

The areas, occurring as they do in the low-lying positions, were probably at one time swampy. The weathering of the rock has occurred by the process of solution alone, and owing to the large amount of soluble matter, but little residual soil has been formed, although the areas are level or nearly so, and there has been but little opportunity for loss by washing. The result of this weathering has been a complete honeycombing or pocketing of the rock surface. These holes or pockets vary in diameter from only a few inches to two feet or more, and in depth from a few inches to 18 or 20 inches. It is in these pockets that the soil has been formed. This consists, in the bottom of the pockets, of a yellow or light brown clayey or putty-like material, spoken of as marl, which is two or three inches or even more in depth. Under this rests a very loose, soft, black, loamy material, mostly decayed vegetable matter, six inches or more in depth. This surface material burns off, unless great care be taken in clearing the land.

Since the marl at the bottom of the pockets is always moist, it may be due to that condition that pineapples succeed so well. The idea current is that the marl itself is practically a fertilizer, and the main source of food for the plants, but the productiveness of this soil is probably due to both the

chemical and physical characteristics of the material and its moisture-holding capacity. Chemically, the marl was found to contain relatively high amounts of potash and lime. Both of these plant-food constituents are important factors in the production of pineapples. It is not known how this land will endure continuous cropping, as it has not been under cultivation long enough to determine this question, but at present it is in considerable demand for the cultivation of this fruit, and ranks as high as the other pineapple lands. Large quantities of fertilizers are used on this soil, as on the Bahama Red Loam.

Its extent, as determined by the survey, is not very great. The largest areas were found in Eleuthera, in the vicinity of Rock Sound, where it is used entirely for the production of pineapples. Other areas were found on Cat and New Providence Islands. More of this soil occurs around swamps, in strips too narrow to be shown on a map of the scale used. The coppice on this soil is similar to that on the Bahama Black Loam, but does not grow to the height attained on the latter.

The mechanical analyses of two typical samples of this soil are given in the subjoined table:

MECHANICAL ANALYSES OF BAHAMA MARL.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.
9401	Red Bay, Eleuthera.	Yellow clayey marl 0 to 12 inches.	15.80	2.34	3.86	2.70	8.66	6.36	19.44	56.18
9413	Nassau, New Providence.	Yellow clayey marl 0 to 12 inches.	15.78	6.10	15.26	9.02	15.01	6.84	20.98	26.72

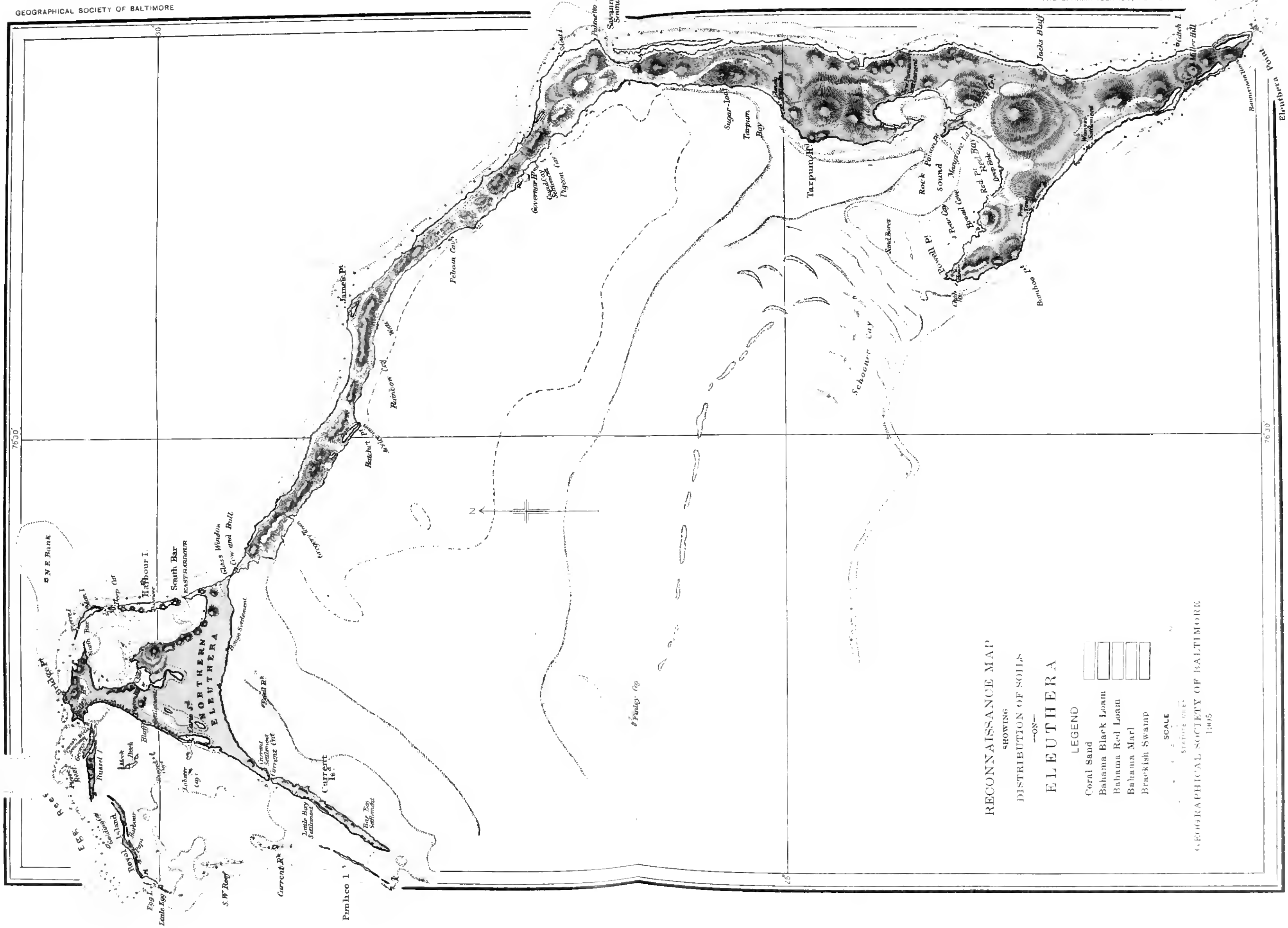
The chemical analysis of a typical sample of the Bahama marl is as follows:

PRINCIPAL FOOD CONSTITUENTS IN BAHAMA MARL.

By acid digestion (HCl sp. gr. 1.115).

Constituents.	Per cent.
Phosphoric acid (P_2O_5)	.010
Lime (CaO)	2.250
Potash (K_2O)	.581
Nitrogen (N)	.015

These figures indicate a rather low reserve of phosphoric acid and nitrogen, but a large amount of potash.


RECONNAISSANCE MAP
SHOWING
DISTRIBUTION OF SOILS
—ON—
ELEUTHERA
LEGEND
Coral Sand
Bahama Black Loam
Bahama Red Loam
Bahama Marl
Brackish Swamp
SCALE
STATUTE MILES
GEOGRAPHICAL SOCIETY OF BALTIMORE
1905
NORTHERN ELEUTHERA
Harbour I.
South Bar
Current Id.
Pimlico I.
Rock Sound
Tarpum Bay
Schooner Cay
Eleuthera Point

PRINCIPAL CONSTITUENTS IN WATER-SOLUBLE SALTS FROM BAHAMA MARL.*
(1 part soil to 5 parts water.)

Sample number.	Location.	Crop conditions, etc.	Parts per million of air-dried soil.					
			Potassium K.	Calcium Ca.	Nitrate NO_3.	Phosphate PO_4.	Chloride Cl.	Sulphate SO_4.
9401	Red Bay, Eleuthera.	Yellow, clayey marl, 0-12 in. from pocket. Lowland. In pineapples. Fertilizer and cave earth applied.	244.0	115.0	13.6	20.8	510.1	64.0
9413	Nassau, New Providence.	Yellow, clayey marl from bottom of pocket. Newly cleared and in pineapples. Fertilized.	51.4	72.8	26.3	12.1	119.6	33.7

* Analyses made on air-dry samples.

These figures show large amounts of soluble phosphates, although the amount of phosphoric acid in this type, as shown by the acid digestion above given, is small. Both the samples here described were heavily fertilized, and show such large amounts of water-soluble mineral constituents as would probably prove detrimental to plant growth if augmented much further. Here again it would probably prove economical to reduce the fertilizer applications and introduce a crop rotation if suitable crops could be obtained for this purpose.

Brackish Swamp.

The brackish swamps, or, as they are called, "salina," occupy a considerable proportion of the area of all the islands. Some occur along the coast, with only a bar of coral sand between them and the sea, while there are also numerous inland swamps bordering on the lakes and ponds. Those along the coast are covered at high tide with sea water. Those inland are more or less brackish, depending upon whether there is subterranean connection with the sea. Some of the inland swamps become quite fresh during the rainy season. The use of the latter for rice culture is being considered, but the practicability of this crop has not been demonstrated. Near Bluff Settlement on Eleuthera is a large swamp covering perhaps 500 or 600 acres which probably could be turned into productive rice fields. It is nearly free from mangrove or anything that would hinder cultivation. The water is only slightly brackish even in the dryest weather. Enough rice could probably be grown on this one area to supply all the inhabitants of the Bahamas. Some rice is reported to

have been grown, and to have done well. But the soil as shown by analysis has generally a salt content too high for successful rice cultivation, unless fresh water could be applied in quantities.

These swamps have but little agricultural value. They are covered with swamp vegetation, mangrove thickets, buttonwood, scrub palmetto, swamp grasses and other water-loving plants.

The soil consists of yellow clayey marl, filling more or less the numerous pockets in the weathered surface of the underlying rock. Mixed with the marl is a large percentage of small rock fragments and small shells. A mechanical analysis of a sample of this type follows:

MECHANICAL ANALYSIS OF BRACKISH SWAMP OR SALINA.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.
9414	Nassau, New Providence.	Yellowish clayey-marl 0 to 8 inches.	10.33	6.61	10.62	4.70	11.88	10.84	34.48	20.74

The chemical analysis of a sample of swamp marl taken near Nassau gave the following results:

PRINCIPAL PLANT FOOD CONSTITUENTS IN SWAMP MARL.

By acid digestion (HCl sp. gr. 1.115).

Constituents.	Per cent.
Phosphoric acid (P_2O_5)	.036
Lime (CaO)	43.630
Potash (K_2O)	.262
Nitrogen (N)	.025

The figures show that this material is mainly calcium carbonate. The other important plant-food constituents are present in but very moderate amounts, and the view that has found some credence that this material would prove a valuable fertilizer is shown to lack justification. The amounts of water-soluble constituents in this type were so large that gravimetric determinations of them have been made, with the following results:

GRAVIMETRIC ANALYSIS OF WATER-SOLUBLE SALTS IN BRACKISH SWAMP OR SALINA.

Constituents.	Per cent.
Calcium sulphate ($CaSO_4$)	.15
Magnesium sulphate ($MgSO_4$)	.07
Magnesium chloride ($MgCl_2$)	.15
Potassium chloride (KCl)	.19
Sodium bicarbonate ($NaHCO_3$)	.49
Sodium chloride ($NaCl$)	.39
Total per cent of soluble salts	1.44

The total amount of salts is seen to be so large that the cultivation of any ordinary crop on this type would be impracticable. There is sufficient sodium chloride present to prevent the growth of all ordinary vegetation.

Bahama White Marl.

The Bahama White Marl did not occur on any of the islands mapped, but was seen in a reconnoissance of Andros, of which it covers the western half. It is reported also to be present upon a number of the islands, and to occupy large areas.

It is low-lying and swampy, and is often covered partially or wholly by salt or brackish waters, and the only vegetation is that which is more or less resistant to salt in the soil. The lower lying portions are covered with a sparse growth of mangrove, while the higher portions, where there is some drainage, support a few scrubby pines and palmettos, with a few other bushes and sedges.

The formation is a white coral material or coral ooze, so finely comminuted that it is almost an impalpable powder, and is very much like chalk. Upon drying, this material contracts into blocks. The material has a depth of from 1 to 3 feet, and is underlain by the same material solidified.

At present it has no agricultural value whatever, and is in fact noted for its unproductiveness.

The analysis of a typical sample of the marl gave the following results:

CHEMICAL ANALYSIS OF BAHAMA WHITE MARL.
By acid digestion (HCl sp. gr. 1.115).

Constituent.	Per cent.
Potash (K_2O)	0.306
Soda (Na_2O)	2.12
Lime (CaO)	47.50
Magnesia (MgO)	2.85
Iron and Alumnia (Fe & Al)	trace.
Nitrogen (N)	0.054
Phosphorus pentoxide (P_2O_5)	0.123
Sulphur trioxide (SO_3)	0.37
Chlorine (Cl)	2.97
Silica (SiO_2)	3.22
Carbon dioxide (CO_2)	40.48
	99.993
Oxygen equivalent of Cl.	.67
	99.323

GRAVIMETRIC ANALYSIS OF WATER-SOLUBLE SALTS IN BAHAMA WHITE MARL.

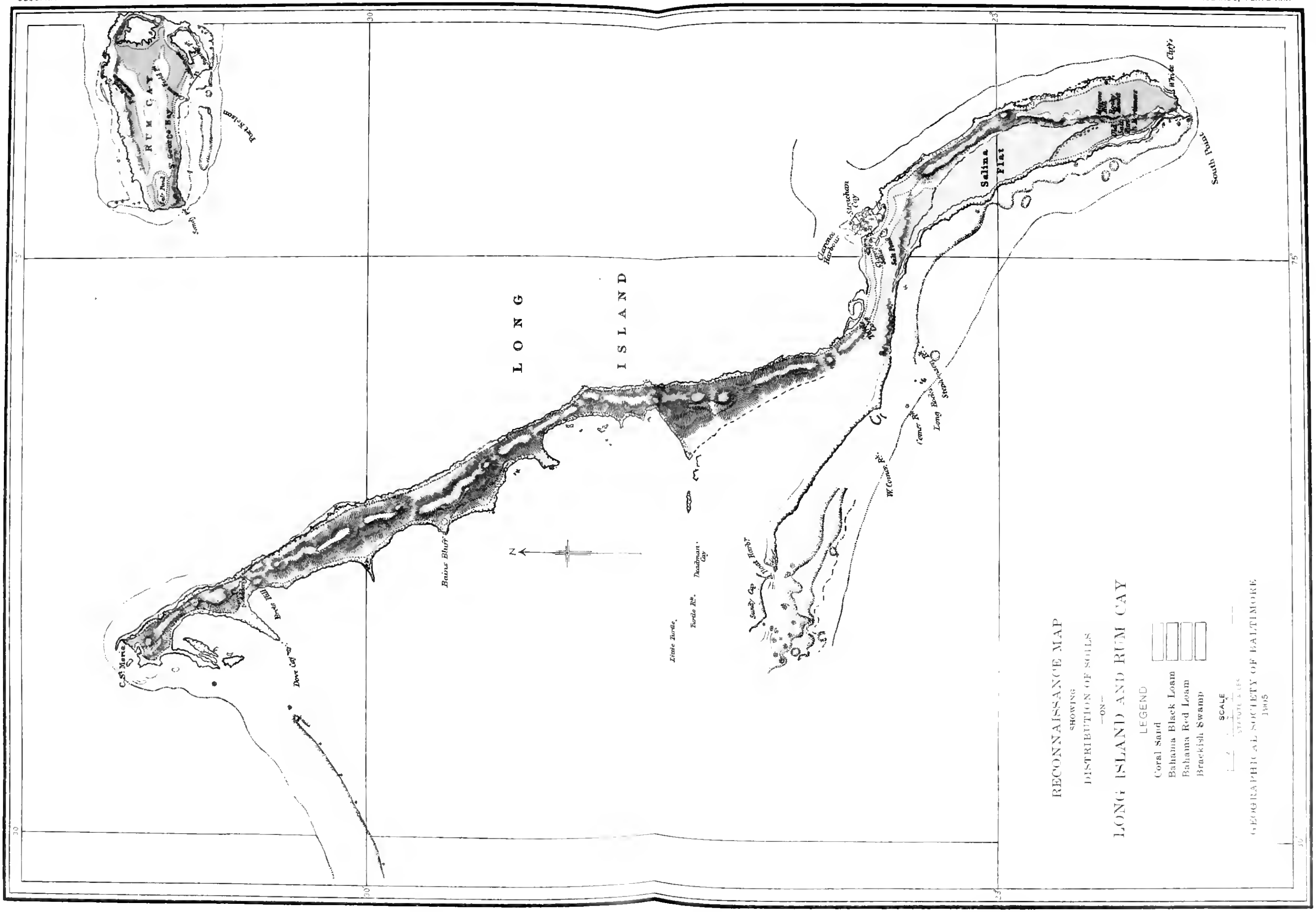
Constituent.	Per cent.
Calcium sulphate ($CaSO_4$)	0.29
Magnesium sulphate ($MgSO_4$)	.24
Magnesium chloride ($MgCl_2$)	.63
Potassium chloride (KCl)	.23
Sodium chloride ($NaCl$)	3.94
Sodium bicarbonate ($NaHCO_3$)	.07
Sodium carbonate (Na_2CO_3)	.01
Per cent soluble salts	5.41

By the above analysis we find that the marl contains over 4 per cent of chlorides, which amount would preclude most plant growths. It had been suggested that this marl would be of value for making soil on the higher lands, where soil is deficient. The practicability of this is not known, and could only be determined by an actual trial. The salts would probably leach out after a few rains. Large quantities of this marl can be easily obtained. Because of its solubility and action with reagents, the mechanical analysis of this type could not be made.

METHODS OF CULTIVATING AND CROPPING.

The primitive methods of cultivation in vogue are the result of circumstances. The stony character of all soils, with the exception of one type (Coral Sand), is such that improved agricultural implements can not be used. The plow, the harrow and other implements of that class, which are used in the agriculture of most countries, are never seen here. Even a hand hoe is of no use on much of the land, for an implement is required that can reach down into the pockets in the rocks. For this purpose the machete or large knife does fairly well. The same practices are employed by the planter of to-day as were utilized by his ancestors. In fact, there has been little improvement in the cultivation of any of the crops, with the possible exception of pineapples. That the methods could be improved in many ways there can be no doubt. There being no large forest trees, the land is easily cleared. The brush is chopped down with a machete, the coarser wood removed, and the remainder burned on the ground. When burning, great care must be taken, for if the soil be dry, and the fire gets too hot, much of the organic matter is burned away, and irreparable injury is done. A large amount of land on all the islands has been injured by careless burning. A wet period is usually selected in which to do the burning, and even then care must be exercised. If the burning has been well done, the field is ready for any crop which it is desired to plant.

The amount of land cleared is small, for as a rule two or three acres is


RECONNAISSANCE MAP
SHOWING
DISTRIBUTION OF SOILS
—ON—
LONG ISLAND AND RUM CAY
LEGEND
Coral Sand
Bahama Black Loam
Bahama Red Loam
Brackish Swamp
SCALE
GEOGRAPHICAL SOCIETY OF BALTIMORE
1905
LONG ISLAND
RUM CAY
Salina Flat
South Point
Clarence Harbour
Strachan Cay
Bains Bluff
Deadman Cay
Little Turtle
Turtle Pt.
Sandy Cay
Dove Cay
C. St. Marie

all that one man can care for. His work is not done in an extensive way, for his object is to grow only enough provisions for his own family. But in these small clearings he grows a little of everything that the soils and climate produce. No systematic arrangement of planting is followed, each product being planted in the spots considered best suited to it. Thus, in the same clearing may be found cocoanut, orange, lime, sapodilla, alligator pear, bread-fruit and other trees, with possibly sugar cane, yams, sweet cassava, onions, tomatoes and other vegetables. This manner of planting applies particularly to the small tracts of the natives, which may be regarded more as gardens than as fields. Such crops as pineapples and sisal are grown in larger fields, devoted to a single crop.

No crop rotation is followed, but in the growing of "provisions" some change in the crop may take place over the field upon replanting. With this system there is no way to estimate yields, and all that can be said is that the people try to grow enough produce to supply their needs. Cultivation is done entirely by hand. The machete is used to dig up the soil for planting, and the after cultivation consists of scratching about the plants with the same implement. Fertilizers or manures, as a rule, are not used on provision crops.

The production of oranges and other fruits is carried on in a haphazard way, no particular care being given either to cultivation or the improvement of the stock. Budding and grafting are practiced, but old methods are employed. So far it has been impossible to introduce the modern methods of budding and grafting.

More care is used in the cultivation of pineapples. After the land has been cleared fertilizer is put into the holes, and a sucker, or, if suckers cannot be had, the top of a pineapple, is planted. The former does much better. Each hole or pocket in the rock usually contains only one plant, so that the number of plants to an acre is dependent upon the number of pockets. The usual number ranges from 2000 to 4000 dozens. There can be no arrangement in rows, and the fields appear very irregular. (Plate XXV, Fig. 2.) Twice a year, usually in April and August, more fertilizer is added, and at the same time the soil is loosened around the plants. In 18 months from planting—the planting being done in August—the first crop of pineapples can be gathered. Crops are gathered for two succeeding years, after which they decline. The picking season extends over four months. Generally three crops are all that can be taken from the original plants. New plants are then set out, and the cropping

continues until the soil becomes unproductive. It is then thrown out of cultivation and allowed to grow up in bush, and after an interval of from 15 to 20 years, as has already been pointed out, it may be cleared again, having in the meantime regained much of its former productiveness. The pineapples, when gathered, are carried in baskets on the heads of laborers to the beach, and then by small boats to the schooner which is to carry the product either to Nassau or to a foreign port.

The sisal plantations are the most extensive on the Islands. Where sisal is grown it occupies the entire field. The method of cultivation is to plant the young suckers in rows 5 feet apart each way. But even greater distances are to be preferred, both because they allow more space for the plants to develop, and also because if it be necessary to reset the field young plants can be started between the old ones, and by the time the latter are ready to be removed the younger ones have leaves large enough to cut. In this way no time is lost and the profits are increased. (Plate LXXXVI, Fig. 2.)

The time required from planting to the first cutting is 4 years, and then 20 to 25 leaves can be cut from each plant. Thereafter from 8 to 10 leaves can be removed every 6 months, the plants lasting from 8 to 10 years. It takes about 100 pounds of the green leaves to make 5 pounds of fiber. The yield varies somewhat, but probably averages about one ton per acre for first year of harvesting and one-half ton a year afterward.

On the large plantations the fiber is cleaned by machinery by passing the leaves through cleaners where the pulp is extracted and the fiber left behind. This is then placed on frames in the sun and when thoroughly dry, packed in huge bales for shipment. (Plate LXXXVII.) Some fiber is produced by hand labor on Cat and some of the other islands. The native method is to tie the leaves in bundles and to macerate them in the brackish water of the ponds, and then, when in proper condition, to beat the leaves upon the coral rocks and to wash them clean in the sea. Afterwards the fiber is hung up to dry and bleach in the sun, and is then put up in small bales for marketing.

The cultivation of sisal requires no particular skill. All that is necessary is to keep down the weeds and other growths, and stir the soil occasionally. No fertilizers are used in the cultivation of this crop.

IMPORTANT CROP AND SOIL PROBLEMS.

The leading industries of the Bahama Islands are the fisheries and agriculture. Those who are interested in the latter are either engaged in grow-

ing pineapples; in raising citrus fruits; or in the production of sisal. Of these three industries the first outranks the other two in importance. Some of the problems affecting these crops will now be discussed.

PINEAPPLES.

The production of pineapples, because of its profitableness, has developed at the expense of the citrus fruit interests. Pineapples and the citrus fruits are grown on distinct soil types, but the former are a much more certain crop, being less subject to disease and the attacks of insect pests. Their cultivation has also come to be better understood. Until recently, as already stated, the Bahamas had no competitors in the pineapple trade, but since the advent in the market of Jamaica, Cuban and Florida pineapples, the Bahama fruit has lost its prestige, the prices have fallen, and with the duty of $7 per thousand imposed by the United States, the industry is not so profitable as formerly, and the growers have become discouraged generally.

There is a large area of soil adapted to the growing of pineapples, and these lands are given up entirely to their production. The practice is to continue the growing of pineapples as long as the land remains productive.

Although there are pineapple soils on all the islands, and particularly the larger ones, yet the industry is centered on Eleuthera and Cat Island. On these the value of the lands has increased greatly, and they have now come into the possession of a comparatively few wealthy men. The fields are owned either individually or in partnership. Outside of these two islands the pineapple fields are small and scattering, and of little consequence.

The pineapples are grown either under the direct supervision of the owner or a foreman, hiring the labor necessary to work the crop. The share system is also practiced.

Only three varieties of pineapples are grown. These are the Sugar Loaf, English, and Scarlet. The first two are very delicious fruits, but not adapted for shipping in the export trade. Only small quantities are grown, and these are used entirely for home consumption. The Scarlet pine is the one grown for the export trade. It is a good shipper, but rather small.

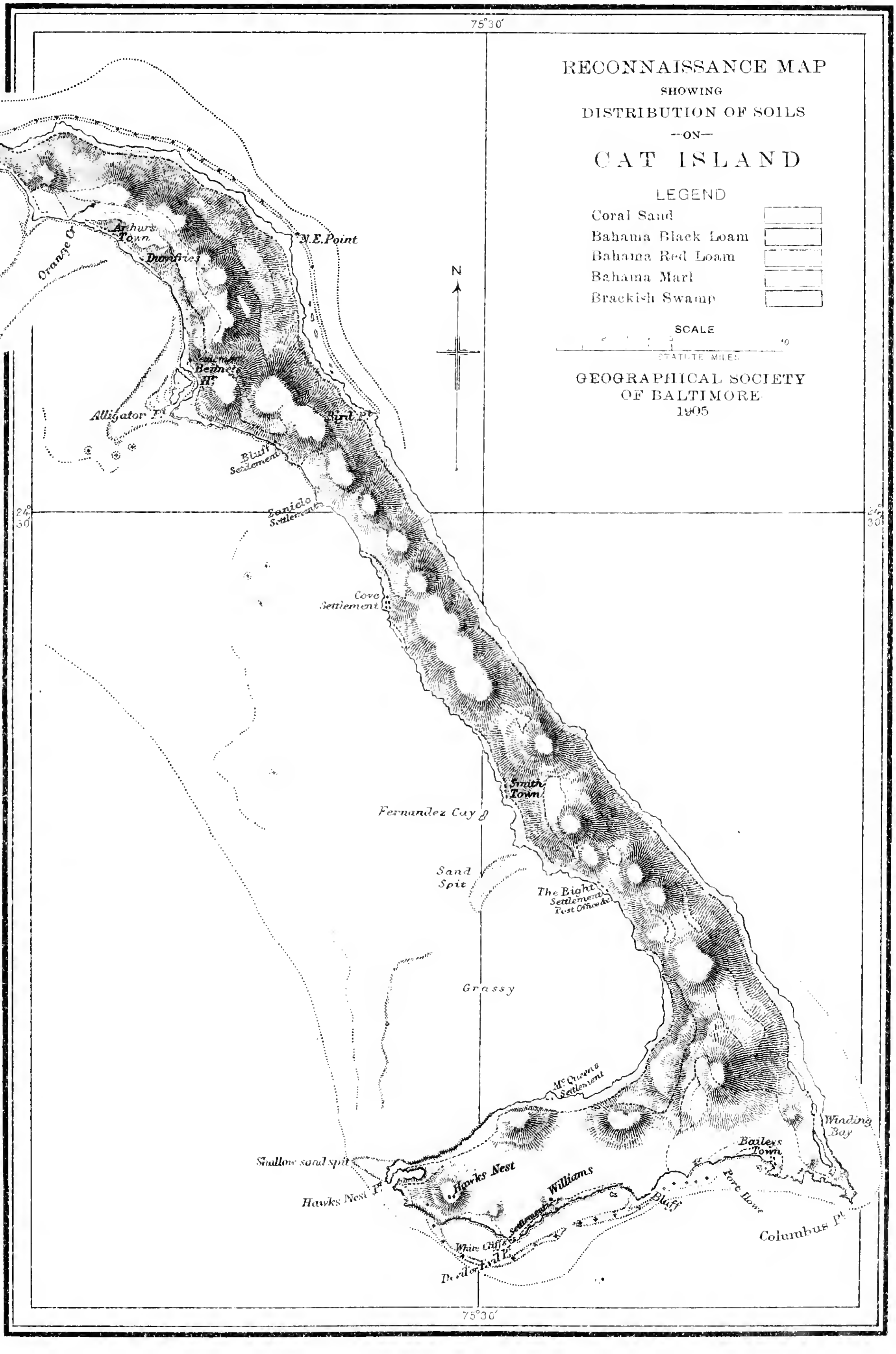
The production varies from year to year, depending upon the season. If the winter, which is the dry season, is not too dry, so that the pineapples do not suffer for moisture, fair crops are obtained, but in late years droughts have been quite common, reducing the yields of this crop, as well as of others.

The pineapple lands have decreased in productiveness. Formerly, on

newly-cleared land, three-fourths of the plants usually bore fruit, while now, in average seasons, only about 40 per cent of the plants are fruitful. That is, where the yield, until only a few years ago, was about 3000 dozens per acre, it is now from 1000 to 2000 dozens. In order to increase the production the planters have resorted to the use of larger amounts of fertilizers. The increase in exports in recent years has been due not alone to this fact, but to a greatly increased acreage. The known pineapple lands have now all been more or less under cultivation, and good land is rapidly becoming scarce. The problem now confronting the planter is to find some means of restoring and maintaining the productiveness of the "worn-out" fields, without the necessity of throwing them out of cultivation for a long period of time, as is the present custom. The Bahama Marl, or "scrub land," which has just come into prominence, has done much to keep up the production to this time.

The markets of the United States are depended upon entirely to take the Bahama pineapples, and until the last few years the fruit was in good demand and the prices were fair. In late years, however, the prices have fallen greatly. Official reports of the Islands show that the exports of 1900, which were over 7,000,000 dozens, brought but little more than the crop of 1892, which was not quite one-tenth as large. The low prices are not due entirely to the competition of other pineapple-producing countries, but in some measure to the poor condition in which the fruit reaches the market. The fruit as grown is of fairly good quality, but in a desire to put it on the market at the earliest possible time, in order to secure high prices, it is gathered too long before maturity. Then, too, the fruit is roughly handled in transporting it from the fields to the boats, and finally it is packed in bulk in the hold of the vessel, without any assortment whatever as to size or condition. The fruit is more or less bruised, and soon deteriorates.

Sailing vessels are depended upon to carry the product. If the weather be favorable and the vessel arrives within a reasonable time, the cargo will sell at fair prices, but if, as often happens, the voyage be prolonged by calms or adverse winds, the fruit arrives overripe and in a more or less unmarketable condition. It is then necessary to dispose of the cargo at once for what it will bring. Under such conditions only the lowest prices can be expected, and occasionally a cargo will not sell for enough to pay the duty. It is the poor cargoes that bring down the total receipts, so that the final outcome is that the grower has received but little, if anything at all, for his crop. The


RECONNAISSANCE MAP
SHOWING
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CAT ISLAND
LEGEND
Coral Sand
Bahama Black Loam
Bahama Red Loam
Bahama Marl
Brackish Swamp
SCALE
STATUTE MILES
GEOGRAPHICAL SOCIETY
OF BALTIMORE
1905
75°30′
24°30′
N
N.E. Point
Arthurs Town
Dumfries
Orange C.
Bennets H.
Alligator Pt.
Bird Pt.
Bluff Settlement
Zonicle Settlement
Cove Settlement
Smith Town
Fernandez Cay
Sand Spit
The Bight Settlement
Grassy
McQueens Settlement
Winding Bay
Baileys Town
Shallow sand spit
Hawks Nest
Hawks Nest Pt.
Williams
Port Howe
Bluff
Columbus Pt.
White Cliffs
Devil or Evil Pt.

small returns, coupled with the increasing cost of production, because of decreasing productivity of the soils and the greater use of fertilizers, have made pineapple growing less profitable. The outlook is decidedly discouraging to the growers, but the conditions, as said before, are largely the result of their own making. The Bahama growers, knowing the conditions, still do not attempt to improve them. It is evident to them that shipping in bulk is not a satisfactory way to put fruit on the market. The market demands that a product be put up in an attractive manner, and this can be done only by using suitable packages. Crates can be obtained at a small cost, and if the fruit were carefully packed it would arrive in good condition, better prices would be assured, and the losses would be reduced to a minimum. But the growers, as a whole, deem it too much trouble to use more than the ordinary or customary means of packing and shipping. That such improvement would increase their profits there is not the slightest doubt. A few growers whose shipments are small, have tried the plan and received increased returns, more than enough to justify the additional labor and cost.

The better shipping facilities possessed by Cuba and Jamaica enable them to compete successfully with the Bahamas. Ocean steamers ply regularly and often between their ports and ports of the United States, while the steamers from the Bahamas are irregular. The use of large vessels in the fruit trade is also hampered by the lack of harbor accommodations for vessels of over 10 feet draught. Therefore the Bahamas must rely entirely upon sailing vessels. There is one objection, however, to shipping pineapples by steamer. The holds of such vessels are hot, and fruit does not keep well, and where it is packed properly in crates, or even in barrels, it should arrive in better condition by sailing boats. Shipment in this way also has the adtage of being much cheaper.

Florida promises to become the strongest competitor in the production of pineapples. The industry is being developed there rapidly, and because railroad facilities can outstrip all competing countries, especially with a heavy duty imposed upon the foreign products. Cuba, Jamaica and Florida all produce larger, improved varieties, which are more in demand, particularly in the fancy trade. The Bahama Scarlet pineapple, although smaller, is sweeter and less fibrous, and if put on the market properly should hold its own against these larger and more showy varieties. The American duty does not discriminate in the matter of quality, and it behooves the Bahama grower to put only the best of fruit upon the market, and by calling attention to its better quality, to create a demand which no competition can injure.

Besides the improvement in the manner of shipping and grading the fruit, there is another important question to be considered, and that is the matter of keeping in closer touch with the markets and endeavoring to put the fruit on the proper market at the proper time. In order to do this an agent should be employed to look after the cargoes as they arrive, and to dispose of them to the best advantage. To this end the growers should form an association, as they have in many sections of the United States. The output of the Islands would warrant such a combination, and the industry being in the hands of a comparatively few growers, it should not be a difficult matter for them to organize.

Some loss has been obviated by the establishment of canning factories to preserve the poorer and overripe fruit. The canned fruit is exported, and is gaining in favor. It was first exported in 1876, and the output of the factories has since greatly increased. In 1900, when such a large crop was produced, over 37,000 cases, valued at about £7000, were exported. At present there are three factories in operation. One is at Nassau and the others are at Governors Harbor and Rock Sound on Eleuthera.

Citrus Fruits.

As stated before, the citrus fruit interests have been neglected, and the production has decreased until it is now small indeed to what it was formerly. Oranges were the first fruit of importance in the export trade. The production has varied greatly. At times it has been practically nothing. For the 30 years preceding 1900 on the average nearly 3,000,000 oranges were exported annually. After the freeze in Florida in 1894-95, when the orange trees were so badly injured, the interest in orange growing revived, and the production was increased to its highest point. But the interest soon waned. The American duty of 1 cent a pound was imposed, and this being too high for the Bahama growers under the conditions existing, they could not compete with profit. It is thus only at times of failure or partial failure in Florida and California, when prices are higher, that the Bahama product will bring enough to justify exporting. In consequence, the orange orchards are neglected. As pointed out before, the production of oranges has always been more or less seriously affected by the scale insects and diseases. With the introduction of improved varieties and proper care of the orchards, large crops could be obtained. At present no good orchards are to be found. The orchards as they existed were small and scattering, and when shipments were sent they were made up of fruit collected from several settlements.

The orchards have never received the care they should, even when the industry was in a flourishing condition. This is due to the lack of knowledge on the part of the growers.

The Bahama Black Loam, which is suited to the production of the citrus fruits, occurs in large areas. Because of the stony character of this type it is better adapted to the production of tree fruits than to the smaller cultivated crops.

As with pineapples, oranges and grape fruit are shipped in bulk in sailing vessels. There is no grading into sizes or as to the condition of the fruit. The consequence is that low prices are received, and with the present import duty levied by the United States, profits are still less than in the case of pineapples.

As stated elsewhere, the production of grape fruit has become more important in the last few years. It promises to become more profitable than any of the other citrus fruits, or even any of the other export products. There is an increasing demand for it in the United States and the supply is not equal to the demand. At present California and Florida are the only competitors. The Florida crop cannot be depended on because of the liability to injury by frosts and freezing, and the California product is of poor quality, and alone cannot supply the trade. In years when the Florida crop fails, the Bahama grape fruit supplies the deficiency, and high prices are received. But even without this factor the production of this fruit proves very profitable. It succeeds well on the Islands, and is of superior quality. The trees are not so subject to disease as the orange. The fruit is most successfully grown by grafting the improved varieties on the native sour orange stock. The trees bear well. Two crops can be picked in a season. The December picking, coming into the market during the holidays, is more in demand and brings higher prices.

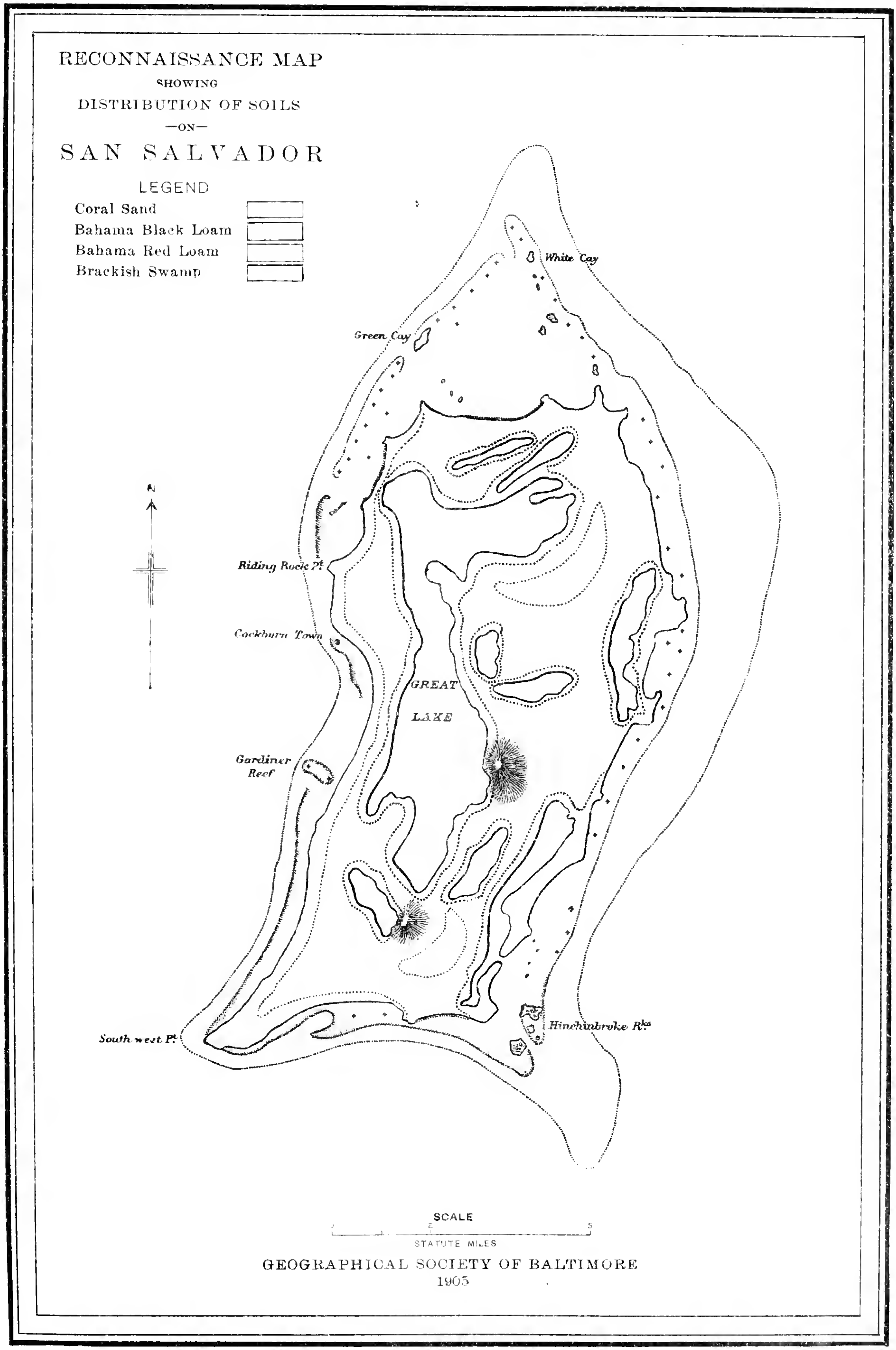
The exports are increasing slowly, but there is a likelihood of more rapid increase if the present high prices continue. But the same haphazard methods of growing are employed as with the orange, the fruit is shipped in the same manner, and as long as this continues the outlook is not without some uncertainty, especially if Florida competition should become stronger and the American duty should be increased.

The fruit meets with a ready sale in the large American cities. It satisfies the demand for a first-class fruit, and with the high prices received the duty can be paid and still leave a fair profit to the grower. There is one grower

on the Islands who has anticipated the demand for a fancy fruit. He has employed the best methods of cultivation from the beginning. Holes were blasted out of the rock in which to set the trees, and these were filled with soil. The trees then received close attention, were carefully cultivated, applications of fertilizer were made, the trees kept pruned, and, by spraying, freed from fungus diseases and insect pests. As a result, large crops of fine fruit are obtained. The fruit is gathered carefully and assorted to certain standard sizes, wrapped in tissue paper, and packed in crates. It is shipped by steamer to New York. An agent is there to receive the shipment, and with instructions to either sell or held in storage, depending on the state of the market. Unlike the pineapple growers, this grower has found a particular market for his product, and is receiving fancy prices by filling the demand for a fruit having certain characteristics as to quality, color, size and shape. A fruit of medium size, slightly flattened, of pale yellow color and thin, polished rind, was found to be preferred. Thus this grower is receiving good returns for his efforts, and has shown the practicability and profitableness of growing only the best grade of fruit for export, and of marketing his fruit in an enterprising manner. If such methods were generally practiced, the condition of the fruit industry would be greatly improved.

Bahama Hemp or Sisal.

The fiber industry of the Bahama Islands promises to become of great importance. If the industry suffered during its early days through lack of knowledge and experience on the part of those who attempted to cultivate sisal without a proper knowledge of the conditions existing in the Islands, such an undesirable state of affairs is gradually being overcome by those engaged in the fiber business at the present time. Experience has shown that with proper management and care, sisal cultivation can be carried on at a good profit. At the present time there is a large acreage under sisal cultivation, which is for the most part cleaned by machinery, and fourteen mills are at the present time operated for this purpose. The market for the Bahama sisal is America, but the obstacles, such as a protective tariff and inadequate shipping facilities which are so detrimental to fruit culture, do not exist for the sisal industry. The fiber does not deteriorate with shipping, is subject to no duty, and is in steady demand with an established reputation for excellence.


RECONNAISSANCE MAP
SHOWING
DISTRIBUTION OF SOILS
—ON—
SAN SALVADOR
LEGEND
Coral Sand
Bahama Black Loam
Bahama Red Loam
Brackish Swamp
N
White Cay
Green Cay
Riding Rock Pt.
Cockburn Town
GREAT
LAKE
Gardiner
Reef
Hinchinbroke Rks
South west Pt.
SCALE
STATUTE MILES
GEOGRAPHICAL SOCIETY OF BALTIMORE
1905

CONCLUSION.

The majority of the population of the Bahama Islands is composed of negroes, who are not well educated; but compulsory education laws are now in force, and it is hoped much good will result. If the educational system could include instruction in practical agriculture and horticulture, this would be a great step toward improving the condition of the people dependent upon the soil for their livelihood. While at present, agriculture is passing through a period of depression, there seems to be no good reason why, with the selection of special crops, more intelligent methods of cultivation, and better business methods, certain lines of agriculture should not succeed well on the Islands. The financial success of a number of men, who employ modern methods of cultivating and marketing their fruit, is a sufficient demonstration of the possibilities of agriculture in the Bahama Islands.

VEGETATION OF THE BAHAMA ISLANDS

VEGETATION OF THE BAHAMA ISLANDS

BY

WILLIAM C. COKER, Ph. D.,

Associate Professor of Botany in the University of North Carolina.

INTRODUCTION.

With the exception of New Providence, the numerous islands of the Bahama group lie outside the usual routes of tropical travel, and access to them can be had ordinarily only through the use of small schooners. The comparative insignificance of the Bahamas in their trade relations has intensified this isolation and resulted in their remaining in large measure, as *terra incognita* to the rest of the world. It is a strange commentary on the mutations of time, that on that very island where Columbus first set foot and praised his God for so fair a landing, there has been placed a lighthouse with but the single purpose of warning the mariner from its lonely shores.

In the hope of adding somewhat to our rather meager knowledge of these Islands, and of bringing into more accessible form the scattered observations of others, the Geographical Society of Baltimore, in the summer of 1903, organized an Expedition for the purpose of their exploration. I, with my two assistants, Mr. C. A. Shore and Mr. F. M. Hanes, was given charge of the botanical side, and this report is the result of observations and collections made during the voyage. As an apology for many deficiencies, I would call attention to the limited time at our disposal, and to the extreme difficulty of drying and preserving plants on the decks of a schooner generally exposed to a stiff breeze. Except in the town of Nassau, where we secured a working room for several days, the plants had to be brought to the boat and there pressed, labelled, and stowed away. On account of the salt air and frequent rains constant attention was necessary to prevent the decay of our specimens. Wherever possible notes were made on the spot, and it is from these that most of my descriptions are taken.

A large part of our time was consumed in sailing from port to port, or rather from point to point, as there are few protected harbors in the Islands;

and at a number of landings we had time for but a few hours on shore and had to avail ourselves of every moment.

On our return, the collections were distributed among a number of specialists, who kindly undertook their determination and who are responsible for the nomenclature. All of the ferns and flowering plants, with the exception of the grasses, sedges and palms, were determined by Dr. N. L. Britton; the grasses, by Dr. H. F. Hitchcock; the palms, by Dr. O. F. Cook; the myxomycetes by Dr. W. G. Farlow; the algæ, by Dr. M. A. Howe; the fungi, by Dr. Geo. F. Atkinson; the lichens, by Mr. W. W. Calkins; the liverworts, by Dr. A. W. Evans; and the mosses, by Mrs. N. L. Britton. To each of these I am under many obligations not only for undertaking the work, but for the kindness that they have in every case shown in furnishing information and in answering my inquiries. To Dr. N. L. Britton, Director of the New York Botanical Garden, my thanks are particularly due for the assistance he so generously offered during my stay of six weeks in the Bronx Park Museum. To Mr. C. A. Shore, who aided me in collecting, and to Mr. F. M. Hanes, who took the photographs, I wish to express my gratitude for faithful assistance under all circumstances.

SKETCH OF BOTANICAL EXPLORATIONS IN BAHAMAS.

Since Mark Catesby's visit in 1725, these Islands have been frequently explored by botanists; unfortunately, however, without system. Most of their scientific exploration has yielded little fruit, as there are but a few publications of any extent on a flora that is both abundant and attractive. Most collectors have been satisfied with making herbaria without troubling themselves with written observations. Some few have merely identified without collecting. The Bahama plants that have been preserved are now, however, quite numerous, and when thoroughly worked up, they will no doubt be found to include the major part of the flora of the Islands.

The earliest collector of whom we have any information was Mark Catesby. After visiting Virginia, the Carolinas, Georgia and Florida, he went to New Providence in 1725. From there he made visits to Eleuthera, Andros, Abaco and other islands. He remained in the Bahamas until 1726 and collected plants from all the points he visited. His collections are now at Oxford and in the British Museum. On his return to England, Catesby published two large volumes of explorations which contained many illustrations.[1] The first

[1] The Natural History of Carolina, Florida and The Bahama Islands, etc. London, 1731-43.

Fig. 1.—Tamarind Tree (Tamarindus indica), Nassau

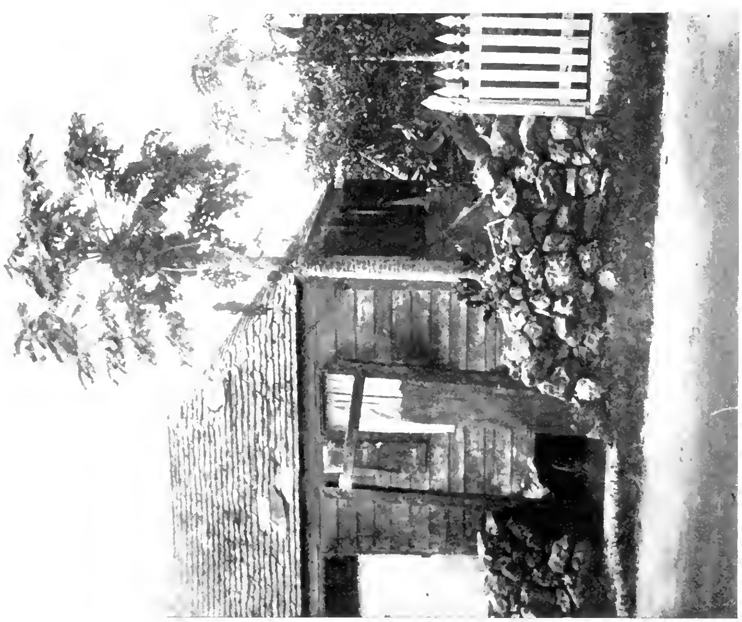


Fig. 2.—Pawpaw Tree (Carica papaya) in Fruit, Nassau

VIEWS ILLUSTRATING VEGETATION

volume appeared in 1731, the second in 1743. Linnæus based some of his species on Catesby's drawings.

No more botanical work seems to have been attempted in the Bahamas until Emperor Joseph II of Austria sent Franz Joseph Maerter, who was Professor of Natural History in Vienna, with several assistants in 1783 to collect plants and animals in America. Landing in Philadelphia, the party travelled through the eastern United States to Florida. From there Maerter, with two companions, Boos and Schöpf, went to New Providence in March, 1784. Maerter remained but two weeks, but Schöpf collected there for three months and Boos until September 9 of the same year. From New Providence these two men made excursions to several of the Out-islands. Of the collections made by this party, some specimens are in the K. K. Hofmuseum in Vienna and some in Brussels. A few years later Andre Michaux, the well-known French explorer and naturalist, went from the southern United States to the Bahama Islands in 1789. There he collected about 863 trees and shrubs and a number of seeds, most of which were carried alive to France and there planted.

A long period of over forty years now elapsed before another botanist explored the Islands. In 1830 a man named Swainson visited the Bahamas and remained there until 1842. Little is known regarding Swainson, not even his first name. He did some collecting on New Providence, but most of his plants are labeled from the Out-islands. His herbarium was taken to Kew, where it was worked over by Grisebach, who incorporated a large number of the species in his "Flora of the British West Indies."[2]

Sixteen years later Justus Adalrik Hjalmarson, who had been living for a number of years in St. Thomas and Porto Rico, visited Grand Turk Island in May, 1858, where he collected for fourteen days. His plants were included in Grisebach's flora.[2] They are now divided between the Kew herbarium, Grisebach's herbarium in Göttingen, and Krug and Urban's herbarium in Berlin. The following year William Cooper, an American, collected in New Providence. His plants (about 150 sheets) are now in the herbarium of the New York Botanical Garden. At about this time Henrik Johannes Krebs, who had also spent most of his life on St. Thomas, paid a short visit to New Providence and collected a few plants which are now in the Botanical Museum in Copenhagen.

[2] Flora of the British West Indian Islands. London, 1861.

No more botanical research was attempted in the Islands until Dr. Anna H. Searing, of Rochester, New York, collected in the Bahamas in 1885. Her plants are included in the list of Gardner, Brace and Dolley.[3] In June of the next year, Dr. F. H. Herrick visited Abaco with a party from the Johns Hopkins University, where he made collections of plants that are now divided between Yale University and Adelbert College, Ohio.[4] During this same year (1886) John Gardner, an Englishman, who was occupying the position of scientific adviser to the Board of Agriculture of the Bahamas, identified a number of Bahama plants and added to Brace's list.[3] He did not, however, make a collection.

For the next two years Baron von H. F. A. Eggers,[5] was busy collecting plants in the Bahamas. He first visited America as an officer in the Danish army. Later he became interested in natural history, and after retiring from the army in 1885, he remained for a number of years in the West Indies, where he made explorations and collected a large number of plants. In July, 1887, he visited Grand Turk and collected some interesting plants. Later he was sent by the British Association to investigate the Bahama flora. Accordingly, in February and March, 1888, he visited New Providence, Acklin, Fortune and Long Islands, where he collected and made notes on the general vegetation. His collections from the Bahamas include about 314 species (in addition to 15 numbers from Grand Turk). They have now been widely scattered, some being at Kew and most of the others with Krug and Urban in Berlin. A number of Eggers's plants have recently been worked up by Urban,[6] who found many new species among them.

During this same year Dr. Charles Sumner Dolley collected in the Bahama Islands and added to the list of Brace and Gardner.[3] His collections are in the herbarium of the University of Pennsylvania. Mr. L. J. Brace, a resident of Nassau, has for years been collecting and preserving Bahama plants. Some time ago he started a list of the flora which was added to and published by Gardner and Dolley.[3] Brace's numbers are now at Kew. During the next year Dr. J. I. Northrop and his wife, Alice Northrop, visited the Bahamas,

[3] Provisional List of the Plants of the Bahama Islands. Proc. Acad. Nat. Sci. Phil., 1889, pp. 349-407.

[4] Notes on the Flora of Abaco and Adjoining Islands. Johns Hopkins Univ. Cir., Vol. VI, 1886, pp. 46-47; also Proc. Acad. Nat. Sci. Phil., 1889, pp. 349-407.

[5] Flora of the Bahamas. Nature, 1888, pp. 565-566; also Die Bahama-Inseln. Globus, Braunschweig, Vol. LXII, 1892, pp. 209-214.

[6] Symbolae Antillanae seu Fundamenta Florae Indae Occidentalis. Berlin.

where they remained for over six months, collecting animals and plants on New Providence and Andros. Dr. Northrop died soon after his return to the United States, but his wife, with the aid of a number of specialists, published a list of the plants which they had collected. This publication is a valuable contribution to our knowledge of the Bahama flora.[7]

During the winter of 1890-91, Dr. A. S. Hitchcock, with a party of naturalists, made a tropical tour including the islands of Jamaica, Grand Cayman and the following of the Bahama group: New Providence, Eleuthera, Cat, Watlings, Crooked, Fortune and Inagua Islands. The plants that he collected on this expedition were published in the IV and IX Annual Reports of the Missouri Botanical Garden. This report includes 380 plants from the Bahama Islands, among which were several new species.[8]

In 1895, Mrs. G. A. Hall, at present a resident of St. Augustine, Florida, visited New Providence and Green Turtle Cay, collecting algæ. She sent a number of species to Agardh, who reported on them in several of his papers.

The activity in botanical exploration in the Bahamas which marked the closing years of the last century has continued over into this. Dr. John W. Harshberger, at present instructor of botany in the University of Pennsylvania, while traveling in the West Indies, stopped for a few hours during July, 1901, at Matthewtown, Great Inagua, and collected some plants.[9]

During the winter of the next year, Mrs. Amelia C. Anthony spent some time on New Providence and collected a number of ferns, a list of which she published later.[10] A. H. Curtiss, a resident of Florida, visited the island of New Providence in 1903 and made a collection of plants which are now in the herbarium of the New York Botanical Garden. During June and July of this same year, the Bahama Expedition of the Geographical Society of Baltimore was making its cruise of the Bahamas and collected material for this present volume.

Since the return of the Bahama Expedition, Drs. N. L. Britton, C. F. Millspaugh and M. A. Howe have collected extensively in the Bahama Islands.

[7] Flora of New Providence and Andros, with an Enumeration of the Plants Collected by John I. Northrop and Alice R. Northrop, in 1890. Mem. Tor. Bot. Club, Vol. XII, 1902, pp. 1-98, pls. 1-19.

[8] Crytogams Collected in the Bahamas, Jamaica and Grand Cayman. Rept. Bot. Garden, Vol. IX, 1898, pp. 111-20; also Plants of the Bahamas, Jamaica and Grand Cayman. Fourth An. Rept. Bot. Garden, 1893, pp. 47-179.

[9] Notes on the Strand Flora of Great Inagua, Haiti and Jamaica. Torreya, Vol. III, 1903, pp. 67-70.

[10] Fern Hunting in Nassau. Fern Bull., Vol. X, 1902, pp. 65-68.

Dr. Britton accompanied by Mrs. Britton visited New Providence in April of 1904, and again during August and September of the same year. His plants are in the herbarium of the New York Botanical Garden, of which he is Director. Drs. Millspaugh and Howe visited New Providence, Joulters, Gun, North Cat and South Cat Cays, North Bimini and South Bimini. The plants collected by Dr. Millspaugh during this expedition number about 394 sheets and are now divided between the Field Columbian Museum of Chicago and the herbarium of the New York Botanical Garden. Dr. Howe devoted his attention to the Algæ and Fungi and brought back a large number of these forms, which were also deposited in the New York Botanical Garden.[11]

COMPOSITION AND RELATIONSHIPS OF THE BAHAMA FLORA.

The number of native and naturalized flowering plants and ferns so far collected and identified from the Bahama Islands is about nine hundred and fifty. This includes collections made by Dr. Britton and Dr. Millspaugh since the return of the Bahama Expedition and not yet published, together with the collection of Mr. A. H. Curtiss, made in the spring of 1903. This number undoubtedly comprises by far the greater part of the plants of the Islands, but there is yet much work to be done before we can know even approximately the extent and variety of their indigenous flora.

The ferns and fern-allies are represented by twenty-five species. Of these, all are ferns except *Psilotum nudum* (L.) Griseb., which is known only from Andros. *Lycopodium*, *Selaginella* and *Equisetum* are not found. The maiden-hair fern (*Adiantum capillus-veneris* L.) and *Asplenium dentatum* L. have been found only on New Providence. There are but five native species of *Gymnosperms*, the *Cycads* being represented by three *Zamias* and the *Conifers* by *Pinus bahamensis* Griseb. and *Juniperus barbadensis* L. All are confined to the northwestern group. Grasses and sedges are represented by a large number of species, most of which are widely distributed in other countries. Of these groups only *Eragrostis bahamensis* Hitch. is endemic.

So far as we are able to determine at present, there are seven indigenous palms in the Islands. The different species have been so variously named, however, that only by examination and comparison of collections can their identity be definitely settled. Hitchcock and Gardner, Brace and Dolley list *Sabal um-*

[11] Notes on Bahama Algæ. Bull. Tor. Bot. Club, Vol. XXXI, 1904, pp. 93-100; also Collections of Marine Algæ from Florida and the Bahamas. Jour. N. Y. Bot. Garden, Vol. V, 1904, pp. 16-166.

braculifera (Jacq.) Mart., from Cat and Fortune Islands respectively, but there is no doubt that this is the same plant as the one we collected from Cat Island and New Providence, and identified by Dr. Cook in this report as *Inodes palmetto* (Walt.) Cook. Hitchcock's *Thrinax argentea* (Jacq.) Lodd., collected on Eleuthera and Cat Islands, is undoubtedly the *Coccothrinax jucunda* Sarg. given in this report, while his *Thrinax parviflora* Sw. is probably our *Thrinax bahamensis* Cook. The cabbage-palm, given in Gardner, Brace and Dolley as *Euterpe oleracea*, is probably Cook's *Cyclospathe northropi*, collected by Northrop and by us. In addition to the four palms listed in this report, Northrop collected one other on Andros, a new species named by Cook, *Paurotis androsana*, and Millspaugh in the spring of this year collected two other species from North Cat Cay and South Bimini, identified as *Thrinax floridana* Sarg. and *Pseudophœnix sargentii* Wendl., respectively. It may prove, however, that when comparison is made these two may be found to be identical with others previously collected.

Among the other *Monocotyledons*, the *Bromeliaceæ*, *Smilacaceæ*, and *Orchidaceæ* are most abundant. Northrop lists six species of *Tillandsia* to which we add *Tillandsia aloifolia* Hook., from Abaco, not before collected in the Bahamas. *Tillandsia usneoides* L., the "gray moss" of our southern States, has been reported only in the list of Gardner, Brace and Dolley. Of *Smilax* there are three or four species at least. Of these, *Smilax beyrichii* Kunth of this report has probably been collected by others under a different name. Of the four species of *Amaryllidaceæ*, *Agave rigida* Mill., the great century plant or bamboo, is by far the most conspicuous. It is singular that it has not been reported from New Providence. The orchids are represented by about thirty species, but they are much in need of further study, as their names have probably been considerably confused by various collectors. Northrop's new species, *Vanilla articulata*, from the Bahamas and Cuba, may be identical with one of the south Florida forms. Of the lily family, but one species is known on the Islands. This is *Aletris bracteata* Northrop, found by Northrop on Andros, and endemic there.

Of all that great group, the *Amentales*, comprising the oaks, hickorys, chestnuts, alders, hornbeams, etc., that make up so large a part of our continental forests, there is but one species, *Myrica cerifera* L., to be found in the Bahama Islands, and it may have been introduced from the United States by the agency of man. It has so far been noticed only on New Providence and Andros. There are several indigenous species of figs, all of which are large

trees. Three are listed in this report and five others are given by Northrop, Hitchcock and Urban. It is very doubtful, however, if there are as many as eight species represented in these collections, and I think it unlikely that there are more than this number of indigenous figs in all the islands of the group.

The *Loranthaceæ* are credited with seven or eight species, but here also the nomenclature has probably been confused. This family is not nearly so abundant in the Bahamas as in some of our other tropical islands, as Jamaica and Cuba. The *Polygonaceæ*, represented in temperate countries only by herbaceous species, comprise a number of Bahama trees of the genus *Coccolobis*. Some of them are among the most common plants of the Islands. No water lilies (*Nymphæaceæ*) had been found until we collected *Castalia ampla* (DC.) Green, on Cat Island, and it remains the only indigenous species of that family so far reported. The great group, *Cruciferæ*, so abundant in the United States, is represented only by the widely distributed littoral plant *Cakile æqualis* L' Her., and the introduced weed, *Lepidium virginicum* L. Of the rose family, *Chrysobalanus* and *Prunus* are the only Bahama genera. The first is represented by two species, the pink-fruited and black-fruited cocoa plums; the second by but one species, *Prunus sphærocarpa* Sw., known only from New Providence. The *Mimosaceæ*, rarely found in the United States, furnished some of the largest and most useful trees of the Islands, such as the horseflesh and will tamarind. The *Cassiaceæ* and *Papilionaceæ* are also well represented. The proportion of woody species to herbaceous ones is greater in these families than it is in the United States. Of the *Zygophyllaceæ*, *Guaiacum* (Lignum vitæ) and two species of *Tribulus* are all that have been collected. *Tribulus cistoides* L. is reported only by Hitchcock. We did not see it at any point and its evident rarity is remarkable when we consider its wide distribution and abundance on other tropical shores. The *Linaceæ* comprise several species of *Erythroxylon* and two species of *Linum*. Of the latter *Linum curtissii* Small is a new species found by Dr. Britton on New Providence and soon to be published. The *Euphorbiaceæ* is one of the most extensive families of the Islands. Most of its representatives are woody species and many of them are trees. The peculiar shrub, *Bonamia cubana* A. Rich., of our collection, had not before been found out of Cuba, and the large tree, *Pera bumeliæfolia* Griseb., also collected by us, has not heretofore been published from the Bahamas. *Securinego acidothamnus* (Griseb.) Muell. Arg., collected by us on Andros, had not previously been found north of St. Thomas. The *Celastraceæ*,

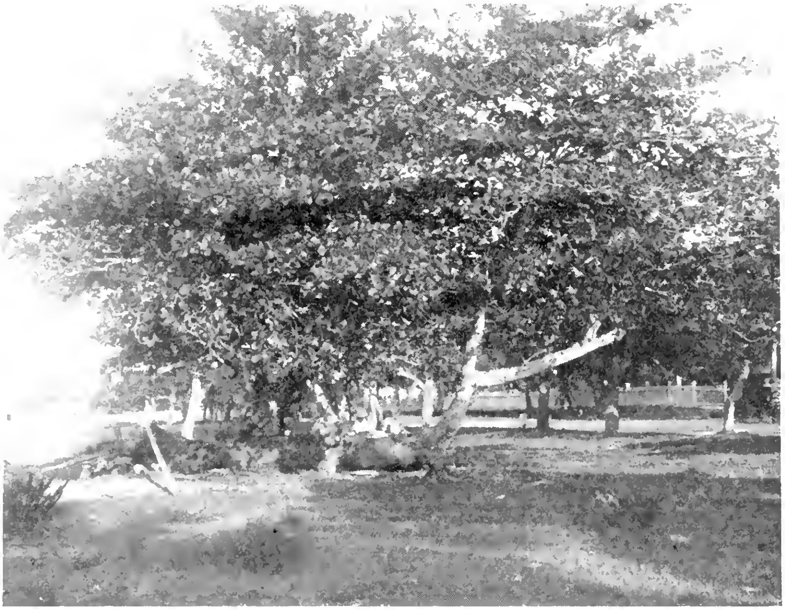


FIG. 1.—"ALMOND" TREE (TERMINALIA CATAPPA), NASSAU

FIG. 2.—FIG TREE (FICUS SAPOTIFOLIA), NASSAU

VIEWS ILLUSTRATING VEGETATION

Rhamnaceæ and *Sapindaceæ* are fairly well represented. In the vine family (*Vitaceæ*), there are a good many species of *Cissus*, but of the true grapes there is only *Vitis rotundifolia* Michx. of the southern United States. It seems to occur only on New Providence. The Virginia creeper, one of our common plants, has been found on New Providence, Andros and Eleuthera. Of the mallows, a new species of *Malvaviscus* from Watlings Island is given in this report. Of the *Cactaceæ*, about six species have so far been reported, but it is probable that a more thorough exploration of the southern islands will add several to this list. It is remarkable that so far no cactus has been found on the island of New Providence.

The *Myrtaceæ* are chiefly represented by the genus *Eugenia*. The guava (*Psidium guava* Radd.), although abundantly planted, is scarcely, if at all, naturalized in the Bahamas. This is rather peculiar, as it has made itself quite at home in a number of the West Indies, where, as in Jamaica, it forms extensive thickets. The cultivated *Pimenta vulgaris* W. A., indigenous to Jamaica, seems also not to have established itself. The failure of these two plants to gain a footing without cultivation emphasizes the restricted conditions of soil and climate furnished by the islands of the group. The *Umbelliferæ*, so abundant in temperate regions, can boast but two indigenous species here. In addition to these, one or two weeds have been introduced from other countries. Of the great heath family, there is but a single Bahama species, *Clethra tinifolia* Sw., and it has been reported only by Gardner, Brace and Dolley. It is also found in Jamaica, Trinidad, Mexico and South America. The two species of the olive family given in this report are the only two found on the Islands. The *Boraginaceæ*, *Verbenaceæ*, *Labiatæ*, *Solanaceæ* and *Scrophulariaceæ* are all fairly well represented, but the largest families on the Islands are the *Rubiaceæ* and *Compositæ*. The *Rubiaceæ* here consist principally of woody species, and the portion of woody species in the *Compositæ* is also greater than in temperate regions. The interesting family *Lentibulariaceæ* contains three Bahama species, two of *Utricularia*, and *Pinguicula pumila* Michx., all insectivorous plants. Families represented in the Bahamas but not included in our list are the following: *Cycadaceæ*, *Potamogetonaceæ*, *Juncaginaceæ*, *Hydrocharitaceæ*, *Liliaceæ*, *Aristolochiaceæ*, *Ranunculaceæ*, *Batideæ*, *Papaveraceæ*, *Polygalaceæ*, *Lythraceæ*, *Onagraceæ*, *Primulaceæ*, *Plumbaginaceæ*, *Ebenaceæ*, *Cuscutaceæ*, *Hydrophyllaceæ*, *Plantaginales*. All except two of these include but one Bahama species.

The relative importance of families, not particularly mentioned above,

may be seen approximately by referring to the list of our collections. The large proportion of genera in comparison with the number of species has already been called attention to by Mrs. Northrop. The number of families represented by only one genus is also much larger than in more northern countries.

With the exception of the *Algæ,* the lower plants have been given little attention by collectors. The *Myxomycetes* listed in this report are the first ever collected from the Islands. Most of them were found during a search of an hour on Mangrove Cay, Andros, and there is no doubt that many others might be brought to light by a more careful examination. Of the nineteen *Fungi* here reported, four were previously collected by Northrop and Hitchcock. Northrop speaks of the scarcity both of *Fungi* and *Lichens,* but, according to our observations, *Fungi* were not at all uncommon and *Lichens* were exceedingly abundant. The latter encrust the bark of most shrubs and trees, even in the mangrove growth along the coast. Of the forty *Lichens* collected by us, one (*Blodgettia confervoides* Harv.) is marine and its exact position is not definitely established. Of the *Algæ,* seventeen of the forty-five collected had been previously reported by Northrop, or by Gardner, Brace and Dolley. Agardh has also described a number of Bahama *Algæ* in various papers, and some have been included in other works. Dr. M. A. Howe, of the New York Botanical Garden, has visited the Bahamas since our return and made extensive collections of *Algæ* on New Providence and several of the smaller northern islands. The eight liverworts of our list are all new to the Islands, none having been found before. Mrs. Northrop includes six mosses in her report, and these, with our two additional ones, make up the meager list of known Bahama forms.

DISTRIBUTION OF THE BAHAMA FLORA.

Both Hitchcock and Northrop have discussed the relationship of the Bahama flora to that of other countries, and each has given tables showing the distribution of the plants collected by them in a number of the West Indies and on the American continent. I have arranged the following table of 795 plants, comprising, in addition to my own, those reported by Hitchcock, Northrop, Grisebach, Urban, and Herrick, together with additional ones in the yet unpublished lists of Curtiss, Britton and Millspaugh.

TABLE SHOWING DISTRIBUTION OF SEVEN HUNDRED AND NINETY-FIVE FLOWERING PLANTS AND FERNS, INDIGENOUS TO THE BAHAMA ISLANDS.

Common to Bahama Islands and Cuba	536
Common to Bahama Islands, Mexico or Central America	311
Common to Bahama Islands and South America	282
Common to Bahama Islands and Southern Florida	322
Common to Bahama Islands and Southern United States	170
Peculiar to Bahama Islands	56

It will be seen from this table that there are about the same number of plants common to the Bahamas and Cuba as are common to the Bahamas and the southern United States including tropical Florida, the numbers being 536 as compared to 492. It is, therefore, evident that a study of the Bahama flora does not indicate any ancient land connections either between Cuba on the one side or Florida on the other. Neither does it furnish any proof against the supposition of such land connections. The majority of the plants common to the Bahamas and to the southern United States, extend also into other tropical countries and it seems probable that these more widely distributed species have invaded both the Bahamas and Florida from the south. Of the 492 plants common to the Bahamas and the United States, there are 40 that are found only in these two regions. Their names and distribution are as follows:

Pinus bahamensis Griseb. New Providence, Andros, Abaco, Great Bahama, and Berry Islands; Florida to North Carolina and Mississippi.

Halophila engelmannii Aschers. Andros, South Bimini (Howe); Southern Florida.

Eragrostis elliotti S. Wats. New Providence; Southern United States.

Distichlis maritima Raf. (*D. spicata* (L.) Green.) New Providence, Watlings and Inagua Islands; Southern United States.

Inodes palmetto (Walt.) Cook. (*Sabal Palmetto* (Watt.) R. & S.) New Providence, Eleuthera, Watlings and Cat Islands; Southern United States.

Coccothrinax jucunda Sarg. New Providence, Green Cay, Eleuthera, and Watlings Islands; Florida.

Thrinax floridana Sargent. North Cat Cay (Millspaugh); Southern Florida.

Pseudophœnix sargentii Wendl. South Bimini (Millspaugh); Southern Florida.

Aletris bracteata Northrop. Andros; Florida.

Smilax beyrichii Kunth. New Providence; Southern United States.

Smilax auriculata Walt. New Providence and Andros; Southern United States.

Myrica cerifera L. New Providence and Andros; Southern United States.

Ficus aurea Nutt. New Providence; Florida.

Salicornia bigelovii Torr. Andros; Southern United States.

Dondia linearis (Ell.) Millsp. New Providence; Southern Florida.

Alternanthera maritima St. Hil. Andros; Southern Florida.

Cassia aspera Michx. Eleuthera; Southern United States.

Linum curtissii Small. New Providence; Florida.

Xanthoxylon cribrosum Spr. Andros; Southern Florida.

Polygala boykinii Nutt. Andros; Southern United States.

Sachsia bahamensis Urban. New Providence and Andros; Florida.
Rhus blodgettii Kearney. North Cat Cay (Millspaugh); Key West, Florida.
Vitis rotundifolia Michx. New Providence and Andros; Southern United States.
Eugenia longipes Berg. New Providence, Andros and Eleuthera; Southern Florida.
Jacquinia keyensis Mez. New Providence, Andros, Abaco, Eleuthera, Rum Cay, Long, Cat and Crooked Islands; Southern Florida.
Mimusops floridana Engelm. Andros; Southern Florida.
Cynoctonum sessilifolia (T. & G.) Britton. Andros; Southern United States.
Sabbatia campanulata (L.) Torr. New Providence, Andros and Cat Islands; Southern United States.
Asclepias paupercula Michx. Abaco; Southern United States.
Ipomœa sagittata Cav. (*I. speciosa* Walt.) New Providence; Southern United States.
Scutellaria longifolia Small. Eleuthera; Southern Florida. (This species has not yet been published.)
Solanum blodgettii Chapman. North Cat Cay (Millspaugh); Key West, Florida.
Gerardia maritima Raf. New Providence, Andros, Eleuthera and Abaco; Southern United States.
Gerardia purpurea L. Andros; Southern United States.
Pinguicula pumila Michx. Andros; Southern United States.
Eupatorium capillifolium (Lam.) Small. New Providence; Southern United States.
Erigeron quercifolium Lam. New Providence and Andros; Southern United States.
Baccharis angustifolia Michx. New Providence; Southern United States.
Iva imbricata Walt. Andros; Southern United States.
Willughbæya heterophylla Small. New Providence, Andros and Abaco; South Florida.

As to the origin of these 40 species, it is difficult to say which have originated in the United States and which in the Bahamas. *Eragrostis elliotti* S. Wats., *Thrinax floridana* Sarg., *Pseudophœnix sargentii* Wendl., *Myrica cerifera* L., *Polygala boykinii* Nutt., *Vitis rotundifolia* Michx., *Rhus blodgettii* Kearney, *Pinguicula pumila* Michx. and *Baccharis angustifolia* Michx. have in all probability migrated from the United States to the Bahamas. As has already been remarked, *Myrica* may have been introduced by man.

If now we divide the Bahama Islands into two groups, the first or northeastern group, comprising Andros, New Providence, Abaco, Great Bahama, the Berry Islands and their adjoining cays, and the second or southwestern group comprising Eleuthera and all the islands south of it, it will be seen from the above list that all except eight of the plants confined to the United States and the Bahamas are found only on the northwestern group. This is what we might expect from the proximity of this group to the Continent.

There are at present, so far as I have been able to ascertain, fifty-six endemic species reported from the Bahama Islands. These, with their distribution, are as follows:

Eragrostis bahamensis Hitch. Inagua.

Thrinax bahamensis Cook. New Providence, Andros, Green Cay, Eleuthera, Cat and Watlings Islands. (Authorities differ as to this. According to Dr. Britton, this is identical with *Thrinax microcarpa* Sarg. from Florida.)

Paurotis androsana Cook. Andros.

Cyclospathe northropi Cook. Andros and Eleuthera.

Hymenocallis arenicola Northrop. New Providence and Andros.

Epidendrum altissimum Bateman. Cat Island and Eleuthera.

Epidendrum gracile Lindl. (Given by Grisebach as from the Bahamas, but he adds no precise locality.)

Epidendrum rufum Lindl. (Given by Grisebach as from the Bahamas, but he adds no precise locality.)

Epidendrum bahamense Griseb. (Given by Grisebach as from the Bahamas, but he adds no precise locality.)

Phoradendron northropiæ Urban. Andros.

Torrubia cokeri Britton. Eleuthera.

Acacia choriophylla Benth. New Providence and Andros.

Pithecolobium mucronatum Britton. Long Island.

Mimosa bahamensis Benth. Fortune Island and Inagua.

Pithecolobium bahamense Northrop. New Providence and Andros.

Cassia caribæa Northrop. Andros.

Cæsalpinia ovalifolia Urban. New Providence and Andros.

Cæsalpinia lucida Urban. New Providence and Eleuthera.

Linum bahamense Northrop. New Providence and Andros.

Erythroxylon reticulatum Northrop. Andros.

Buxus bahamensis Baker. New Providence, Andros and Watlings Islands.

Phyllanthus bahamensis Urban. Andros.

Euphorbia cayensis Millsp. Rum and Joulters Cays.

Salvia bahamensis Britton. New Providence.

Croton hjalmarsonii Griseb. Fortune and Inagua Islands.

Crassopetalum coriaceum Northrop. Andros.

Thouinia discolor Griseb. New Providence, Andros, Eleuthera, Cat, Fortune and Inagua Islands.

Reynosia northropiana Urban. Andros.

Sphæralcea abutiloides Endl. New Providence.

Malvaviscus cokeri Britton. Watlings Island.

Pavonia bahamensis Hitch. Fortune Island.

Helicteres spiralis Northrop. Andros, New Providence and Eleuthera Islands.

Waltheria bahamensis Britton. New Providence.

Xylosma ilicifolia Northrop. New Providence, Andros and Eleuthera Islands.

Passiflora pectinata Griseb. New Providence, Andros and Turks Islands.

Bourreria thymifolia Griseb. Rum Cay and Turks Islands.

Terminalia spinosa Northrop. Andros.

Casearia bahamensis Urban. Andros.

Bumelia loranthifolia (Pierre) Britton. New Providence, Andros and Eleuthera.

Metastelma eggersii Schltr. Fortune Island.

Metastelma barbatum Northrop. New Providence and Andros Islands.

Plumiera bahamensis Urban. Acklin Island.

Cordia bahamensis Urban. Fortune and New Providence Islands.

Heliotropium nanum Northrop. Andros.

Tecoma bahamensis Northrop. New Providence and Andros Islands.

Jacaranda bahamensis R. Br. Andros.

Jacaranda cærulea Griseb. New Providence and Cat Islands.
Catesbæa paniculata Northrop. Andros and Green Cay.
Scolosanthus bahamensis Britton. New Providence.
Ernodea cokeri Britton. Abaco.
Stenostomum myrtifolium Griseb. (Given in Grisebach as from the Bahamas, but he adds no precise locality.)
Myrstiphyllum ligustifolium Northrop. Andros.
Scolosanthus bahamensis Britton. New Providence.
Anguria keithii Northrop. Andros.
Eupatorium bahamense Northrop. Andros.
Vernonia bahamensis Griseb. New Providence, Andros, Cat and Inagua Islands.

Among the endemic species mentioned by Mrs. Northrop are included *Croton eleuteria* Sw., which was found by Hitchcock on Grand Cayman, and *Vanilla articulata* Northrop, which she gives in her table of distribution as also from Cuba. To the endemic species listed above we may probably add *Zamia tenuis* Willd., as it is not certainly known outside of the Bahamas.

The fifty-eight flowering plants that, so far as I have been able to determine, have not before been reported from the Bahamas, are given with their distribution in the table on the page following.

In discussing the relationships of the Bahama flora, we must not forget that the limestone soil and exposure to salt, drought and wind, to which its flora is subjected, would preclude the occurrence in those Islands of many groups of plants that are particularly partial to certain sorts of soil or to fresh water, shade and low temperature. When this is kept in mind, we are not surprised at the absence of such families as *Araliaceæ* and *Piperaceæ,* although both are quite common in the larger islands of the West Indies, and the *Araliaceæ* in the United States also. *Peperomia magnoliæfolia* (Jacq.) C. DC., for example, is found in the Bermudas, in south Florida and in several of the West Indies, but neither it nor any other member of its family is found in the Bahamas. The absence of *Selaginella, Lycopodium* and *Equisetum* is also in all probability due to uncongenial conditions and not to the lack of means of distribution. On the other hand, the absence of *Sapindus saponaria* L. is difficult to account for, as it is abundant in Florida, Jamaica, and Central and South America, and in these countries seems able to endure sandy soil and maritime conditions. The singular rarity of *Tribulus* in the Bahamas has already been remarked upon.

The distribution of plants among the different islands of the group is a matter of considerable interest. As is to be expected, the littoral plants are practically identical in all the islands, and the majority of other forms also show no particular anomalies of distribution. Attention has already been

FIG. 1.—ROYAL PALM (ROYSTONIA REGIA) IN A GARDEN AT NASSAU

FIG. 2.—PINE TREE (PINUS BAHAMENSIS), SURROUNDED BY SILVER PALM (THRINAX BAHAMENSIS), NEW PROVIDENCE

VIEWS ILLUSTRATING VEGETATION

ABLE SHOWING DISTRIBUTION OF FLOWERING PLANTS COLLECTED DURING THE BAHAMA EXPEDITION AND NOT PREVIOUSLY REPORTED FROM THE BAHAMA ISLANDS.

Species.	Geographic Distribution.																											
	Abaco.	Andros.	Cat Island.	Cuba.	Eleuthera.	Europe.	Green Cay.	Guadeloupe.	Haiti.	Jamaica.	Joulters Cay.	Long Island.	Mexico.	New Providence.	North America.	Porto Rico.	Rum Cay.	South America.	South Bimini.	Southern California.	Southern Florida.	Southern United States.	St. Thomas.	Texas.	Virgin Islands.	Watlings Island.	West Indies.	West Indies (French).
Halophilla engelmannii Aschers [a]		*																	*		*							
Andropogon virginicus L.	*			*																		*						
Andropogon tener Kunth.														*														
Paspalum vaginatum Sw.														*												*		
Panicum elephantipes Mees.					*																					*		
Setaria macrostachya H. B. K.		*	*									*		*			*									*		
Setaria filiformis Sw.														*														
Cyperus vahlii Strud.												*																
Schœnus nigricans L.			*											*												*		
Tillandsia aloifolia Hook.	*																	*			*	*						
Smilax beyrichii Kunth.														*							*	*						
Ficus sapotifolia Kunth. & Benche.										*				*							*							
Chenopodium spathulatum Sieb. [b]					*					*			*					*		*								
Alternanthera maritima St. Hil. [c]		*																			*							
Amaranthus tristis L.										*				*				*										
Petiveria alliacea L.				*						*			*	*							*							
Torrubia obtusata (Jacq.) Britton														*														
Torrubia cokeri Britton					*																							
Castalia ampla (DC.) Green			*	*						*			*					*						*				
Capparis jamaicensis Jacq.										*		*						*			*							
Pithecolobium mucronatum Britton [d]												*																
Cæsalpinia vesicaria L.				*								*																
Cassia lineata Sw.							*							*														
Cassia aspera Michx.					*																	*						
Simaruba glauca Kunth				*						*				*							*							
Croton discolor Willd.				*			*																		*			
Phyllanthus virens Muell. Arg.				*	*																							
Euphorbia havanensis Willd.				*										*							*							
Euphorbia brasiliensis L.					*					*						*		*				*						
Euphorbia cayensis Millsp. [e]											*						*											
Savia bahamensis Britton [d]														*														
Bonamia cubana A. Rich. [f]			*	*																								
Pera humeliæfolia Griseb. [g]				*										*														
Securinega acidothamnus (Griseb.) Muell. Arg.		*																					*					
Gyminda grisebachii Sarg.				*								*				*					*							
Malvaviscus cokeri Britton																	*											
Passiflora rubra L.										*				*				*										
Opuntia triacantha DC. [g]																	*										*	
Eugenia confusa DC.		*	*		*			*				*					*											
Eugenia punctata Vahl.					*				*																			*
Zuelania lactioides Rich.														*														
Fœniculum fœniculum (L.) Karst [h]						*								*								*						
Bumelia loranthifolia (Pierre) Britton		*	*											*														
Lucuma multiflora A. DC.										*			*	*		*									*			
Adelia segregata (Jacq.) Small				*	*					*			*									*						
Ximenia americana L. [i]										*			*				*	*			*							
Metastelma brachystephanum Griseb. (?)				*								*																
Ipomœa sagittata Cav.														*								*						
Cordia cylindrostachya R. & P.					*					*		*						*		*					*			
Lippia stæchadifolia Kunth. [j]			*	*						*			*															
Citharexylum quadrangulare Jacq.		*								*		*						*							*	*		
Salvia micrantha Vahl.		*		*	*					*			*	*														
Scutellaria longifolia Small					*																*							
Solanum havanense Jacq.					*																							
Datura arborea L.														*		*		*										
Galium hispidulum Michx.	*																					*						
Ernodea cokeri Britton [d]	*																											
Scolosanthus bahamensis Britton														*														
Baccharis angustifolia Michx.														*								*						
Leptilon canadense (L.) Britton [k]					*	*									*		*	*										

[a] Found by Howe on South Bimini subsequent to the return of the Bahama Expedition. [b] A weed in most warm countries. [c] Tropical America. [d] Endemic. [e] Endemic on Joulters Cay. [f] Confined to Cuba and Bahamas. [g] Described by DC. from West Indies. [h] A weed from Europe. [i] Tropics of both hemispheres. [j] Tropical America. [k] A widely distributed weed in Europe, North America, South America, etc.

called to the rarity on the southeastern group, of plants common to the Bahamas and the southern United States. Mrs. Northrop found on the damp, open savannas of Andros a considerable number of plants that she mentions as confined to that environment. That their absence on most of the other islands is due to the lack of similar conditions is shown by our finding several of them in the Killarney pine barrens of New Providence, where the conditions are nearly the same as on the savannas of Andros. As the smaller islands rarely offer any environment approaching that of these savannas, we would not expect to find upon them plants that are partial to such situations.

The pines and cedars are confined to the northeastern group (New Providence, Andros, Abaco, Great Bahama, and the Berry Islands), while the *Cactaceæ* are mostly southern in their distribution. So far, no member of the latter family has been reported from either New Providence, Abaco or Great Bahama, and, according to Northrop, there are none on the northern half of Andros. *Cereus swartzii* Griseb., *Opuntia spinosissima* Mill., and *Opuntia tuna* Mill. occur on the southern half of Andros. The first is found also on some of the southern islands, and the last on Eleuthera, Rum Cay and Watlings Island. *Opuntia triacantha* DC., found by us on Rum Cay, is said by Gardner, Brace and Dolley to occur also on Watlings and Concepcion Islands. The same authors also give *Melocactus communis* DC. as indigenous to Turks Islands and wild on Acklin Island, while a species of *Echinocactus* is listed by them from Inagua and southern islands. The tall, columnar *Pilocereus lanuginosa* Rumpl. is not uncommon on Eleuthera, Long and Watlings Islands and probably extends to the southernmost members of the group. Other species of cactus will probably be found on Inagua and Grand Turk Islands. They have been so little explored that their flora is practically unknown.

The poison-wood, which is so common on New Providence, Andros and Abaco, is much rarer on the eastern and southern islands. We did not find it on the northern part of Eleuthera and it was not at all common on Cat Island, Rum Cay, or Watlings Island. *Duranta repens* L. is very abundant on the western islands, but outside of these it has been reported only once, from Eleuthera, by Hitchcock. We did not find it on any of the eastern group. *Byrsonima lucida* (Sw.) DC. is also common on the western and rare on the eastern islands. We found a few specimens on Cat and Watlings Islands. *Vanilla articulata* Northrop, found on Andros by Northrop, was collected by us on New Providence and Watlings Island. It is also said to occur on

Long Island. *Zamia tenuis* Willd. is confined to New Providence and Andros, and *Prunus sphærocarpa* Sw. is known only from New Providence. There are, of course, a large number of species that have so far been collected from only one spot, but most of these will no doubt later be found to be more widely distributed. Until each island has been pretty thoroughly explored, it will scarcely be worth while to go into any detailed discussion of local distribution. Our data are at present not sufficient to warrant any definite conclusions.

INDIGENOUS TREES AND SHRUBS USEFUL FOR THEIR WOOD OR LEAVES.[12]

Inodes palmetto (Walt.) Cook (Thatch Palm).

Plate XXXVII, Fig. 1.

This is the same as the palmetto of our southern United States. Its leaves are used for thatching and sometimes for baskets. It has been reported from New Providence, Eleuthera, Cat and Watlings Islands.

Coccothrinax jucunda Sarg. (Silver-thatch Palm).

A smaller palm than the preceding. The silvery leaves, which are much used for making hats and baskets, are collected green and dried in ovens. This palm is common along the shores of New Providence, Green Cay, Eleuthera and Watlings Island. It also occurs in Florida.

Thrinax bahamensis Cook (Goat Palm. Silver Palm).

Plate XXXVIII, Fig. 2.

This is about the same size and appearance as the silver-thatch palm, but the two may be readily distinguished when in bloom by the honey fragrance of the former plant and the fetid odor of the latter. Leaves of the goat palm are used for the same purposes as those of the preceding. It is endemic to the Bahamas and has so far been found on New Providence, Andros, Green Cay, Eleuthera, Cat and Watlings Islands.

Cæsalpinia vesicaria L. (Braziletto).

A small tree with dark heart wood that produces a valuable red or yellow dye. We found it on Long Island and it is said to grow on the western end of New Providence. It is also a native of Cuba, Jamaica and Haiti. We cannot find that it is now exported from the Bahamas.

[12] The words "Jessup Coll." following a species indicate that its wood may be found in the Jessup Collection of woods at the American Museum of Natural History, New York City.

HÆMATOXYLON CAMPECHIANUM L. (Logwood).
Plate XXXIX, Fig. 1.

A low, spreading tree with a deeply furrowed trunk. The wood furnishes the valuable blue dye hæmatoxylon. Considerable quantities of it are shipped from Nassau to New York. We met with it on New Providence, Eleuthera and Long Island. Mr. R. S. Sweeting, of Nassau, told me that most logwood for export is obtained from Andros, Exuma and Cat Islands. Logwood is a native of Central and South America and was probably introduced into the Bahamas, where it has now become thoroughly naturalized.

LYSILOMA PAUCIFOLIA (DC.) Hitch. (Horseflesh).

This probably reaches a larger size than any other tree in the Bahamas. On Mangrove Cay, Andros, we found it growing to a height of 45 feet, with a diameter of 18 inches. In the deeper forests of Andros, it grows much larger than this, and timbers two feet square are sometimes obtained from it. The wood is dark, heavy and capable of a high polish. It is valued for cabinet-making and interior decoration. It is shipped in considerable quantities from Nassau to Liverpool. The horseflesh occurs on New Providence, Andros, Eleuthera and Fortune Islands, and is also a native of Cuba.

LYSILOMA LATISILIQUA (L.) Benth. (Wild Tamarind).

The wild tamarind approaches but does not reach the size of the horse-flesh. It is sometimes 40 feet high on New Providence, but attains its greatest size on Andros. The wood is heavy and hard, and of a reddish-brown color. It is in demand for furniture-making and shipbuilding. The wild tamarind is found on New Providence, Andros, Long, Cat, Fortune and Inagua Islands, and in south Florida and Cuba. It was previously exported from Nassau to Liverpool.

SWIETENIA MAHOGANI L. (Mahogany or Madeira).

A large tree, reaching its greatest size on Andros. It is rather common in the coppice around Nassau, but is there not often over 15 feet in height. Several fairly large specimens may be seen just where the road dips over the Blue Hills. The wood is very hard and heavy, and is much used in furniture and cabinet-making. The madeira is found on New Providence Andros, Crooked, Fortune and Inagua Islands. It is also widely distributed in the West Indies, Central and South America. The wood is shipped from Nassau to Liverpool. (Jessup Coll.)

GUAIACUM SANCTUM L. (Lignum Vitæ).
Plate XXXVI, Fig. 1.

A medium-sized tree with spreading top. The wood is heavy, hard and very difficult to split, and is used in the manufacture of pulleys, hubs, mallets, ten-pin balls, etc. The resinous gum is a stimulant and alterative and is used in the compound decoction of sarsaparilla. The lignum vitæ occurs on New Providence, Long, Fortune, Crooked, Acklin and Watlings Islands, and in south Florida, Cuba, Porto Rico and San Domingo. It is not now exported from the Bahamas. (Jessup Coll.)

PINUS BAHAMENSIS Griseb. (Pine).
Plate XXXV, Fig. 2.

A tall, rather slender tree considerably resembling *Pinus tæda* L. and now known to be identical with *P. elliottii* Engelm. from Florida. Specimens 55 feet in height and 2 feet in diameter at base were seen on New Providence. The wood decays rapidly and is not considered of much value. During our Civil War turpentine and resin were obtained in considerable quantities from the Bahama pine forests, but the industry is no longer active. The pine covers large areas of New Providence, Andros, Abaco, and probably occurs on Great Bahama.

JUNIPERUS BARBADENSIS L. (Cedar).

A small tree much resembling *Juniperus virginiana* L. The wood is particularly good for pencil-making, but the supply is now so limited that none is exported from the Bahamas. This is the cedar that was so highly valued for shipbuilding in the early days of exploration. It occurs on the western end of New Providence, on Andros and Abaco, and in the Bermudas, Jamaica, San Domingo and Antigua. According to Sargent, the south Florida cedar is this species, and not *Juniperus virginiana* L., as usually described.

GYMNANTHES LUCIDA Sw. (Crabwood).

A small tree, rarely over 20 feet high in the Bahamas. Walking-sticks of superior quality are made from the shoots. It occurs on Andros, Abaco, Eleuthera and Watlings Islands, and in south Florida and many of the West Indies. (Jessup Coll.)

FAGARA FLAVA (Vahl) Kr. & Urb. (Yellow-wood).

A small tree with hard, brittle wood that is used in making furniture and for the handles of tools. The plant is found on Andros, Abaco and Long

Islands, and in south Florida, Porto Rico and San Domingo. Species of *Fagara* are used for making walking-sticks. (Jessup Coll.)

RHIZOPHORA MANGLE L. (Mangrove).

Plate XLI, Fig. 2, and Plate LXXXIV, Fig. 1.

This remarkable plant is usually a shrub or small tree in the Bahamas, but on Watlings Island we found a grove that was 35 feet high. In Jamaica it sometimes reaches 70 feet. The wood is heavy and strong and, according to Sargent, is used for fuel and wharf-piles, on account of its strength and immunity from attacks of the teredo. Richard Ligon says in "A true and exact History of the Island of Barbados," 1657: "The Mangrove is a tree of such note, as she must not be forgotten; for, though she be not of the tall and lusty sort of trees, yet, she is of great extent; for there drops from her limbs a kind of Gum, which hangs together one drop after another, till it touch the ground, and then takes root, and makes an addition to the tree. So that if all these may be said to be one and the same tree, we may say that a Mangrove tree may very well hide a troop of Horse. The bark of this tree being well ordered will make very strong thred whereof they make Hamocks, and divers other things they wear; and I have heard that the linnen they wear is made of this bark, as also their chaires and stooles." The mangrove occurs in shallow salt water on all the Bahama Islands, and is widely distributed in the tropics of both hemispheres. (Jessup Coll.)

JACQUINIA KEYENSIS Mez. (Joe-bush).

A low, stout shrub or tree with small, thick leaves. Though very brittle, the wood is heavy and hard, and takes a good polish. A decoction of the leaves and bark is used by the negroes for washing the head.

HIPPOMANE MANCINELLA L. (Manchineel).

This is probably the most poisonous of all trees, and its baneful properties attracted the attention of many of the early writers. Though highly poisonous, the injurious effects of the manchineel, like those of the upas, have been greatly exaggerated by imaginative explorers. The milky sap no doubt causes great inflammation in most cases, but I handled it on several occasions with no worse results than a small, temporary blister. The manchineel tree is about the height and shape of an apple tree, and its fruit superficially resembles the crab-apple. It was often mistaken for an edible fruit by explorers, who suffered much evil in consequence. The wood when dried loses

FIG. 1.—LIGNUM VITÆ TREES (GUAIACUM SANCTUM), SHOWING THE EFFECT OF PREVAILING WINDS, CLARENCE HARBOR

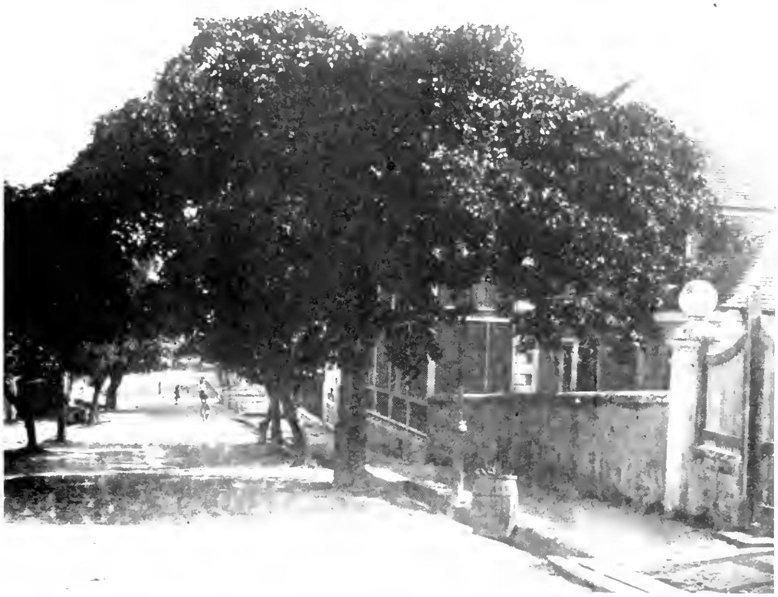


FIG. 2.—SAND-BOX TREE (HURA CREPITANS), NASSAU

VIEWS ILLUSTRATING VEGETATION

its irritating qualities, and is highly valued for furniture-making. Catesby, in his "Natural History of Carolina," says that the wood is "very heavy and durable, beautifully shaded with dark and light streaks, for which it is in great Esteem for Tables and Cabinets, and other curious works in Joynery." Hans Sloane, in "The Nat. History of Jamaica," Vol. II, speaks of the manchineel as follows: "Goats feed on the fruit when fallen from the Trees, very greedily and in great Plenty, and yet neither their Flesh, nor which is more wonderful, their Milk is in the least poysonous, but eaten indifferently as other milk." He also notes that its wood is much "coveted by all People, not only for its being able to endure the Polish, but for its Durability, and likewise for its delicate and pleasant Colours, which are dark." Gifford Hughes, in "The Nat. History of Barbados," London, 1750, makes the following observations: "I shall conclude the Description of this Tree with a remarkable Observation, generally found to be true; which is, that wherever a Manchineel-tree grows, there is found a White-wood or a Fig-tree, near it; the Juice of either of the latter being an infallible antidote against the Poison of the former." Occurs on Andros, Watlings and Inagua Islands, and in south Florida, the West Indies, Mexico, Central and South America. (Jessup Coll.)

SIDEROXYLON MASTICHODENDRON Jacq. (Mastic).

A tree reaching 70 feet high in some countries, but rarely over 40 feet in the Bahamas. The wood is hard and close-grained, and is valued in Florida for boat-building, as it is not injured by the teredo. It is found on New Providence, Andros and Eleuthera, and in south Florida and the West Indies. (Jessup Coll.)

DIPHOLIS SALICIFOLIA A. DC. (Wild Cassada, or Bustic).

A graceful tree, often 40 feet high in Florida, but rarely reaching that size in the Bahamas. The wood is heavy, strong, and takes a fine polish. It occurs on New Providence, Andros and Eleuthera, and in Cuba, Jamaica, and in other parts of the West Indies. (Jessup Coll.)

METOPIUM METOPIUM (L.) Small (Poison-wood).

A good-sized tree of the same family as our poison ivy, which it resembles in the irritating effect of its juice. The gum is used in medicine as a purgative and emetic. The wood is heavy and hard, but not strong. In some countries it is used, but it does not seem to be much valued in the Bahamas.

Of the poison-wood, Richard Ligon in "A True and exact History of the Island of Barbados, 1657" says: "The poysoned tree, though I cannot commend for her vertues, yet for her beauties I can. . . . . Yet, of this timber we make all, or the most part, of the Pots we cure our Sugars in; for, being sawed, and the boards dryed in the Sun, the poyson vapours out." (Jessup Coll.)

INDIGENOUS MEDICINAL PLANTS.

Ichthyomethia piscipula (L.) Hitch. (Dogwood).

A small tree with peculiar, winged pods constricted into joints. The narcotic, sedative root and bark are exported from Nassau for medicinal purposes. Parts of the tree are used by the natives to stupefy fish. The dogwood ocurs on Andros, Abaco, Eleuthera and Cat Islands, and in south Florida, the West Indies, Central and South America. (Jessup Coll.)

Picramnia pentandra Sw. (Snake-root or Bitter-wood).

A tree 20 feet high in damp places, but dwarfed and procumbent on barren plains. The root, which is used medicinally as a tonic and febrifuge, is exported from Nassau. It is found on New Providence and Eleuthera, and in Cuba, Jamaica, Antigua and Guadeloupe.

Canella winterana (L.) Gaertn. (Wild Cinnamon or Bahama White-wood Bark).

This shrub or small tree furnishes the well-known canella bark or cortex canelli albæ, which is used as an aromatic stimulant and tonic. It has a pleasant, cinnamon-like odor and a bitter taste. Shipments of this bark are made from Nassau to New York, but it is not so much used as formerly. Canella is found on New Providence, Andros and Rum Cay; also in the West Indies and Venezuela. (Jessup Coll.)

Croton eluteria (L.) Sw. (Cascarilla or Sweet-wood Bark).

A shrub or small tree, the bark of which is used as an aromatic tonic. It is obtained principally from Eleuthera, and is shipped to New York from Nassau. It occurs on New Providence and Eleuthera, and in Jamaica and Grand Cayman.

Simaruba glauca Kunth.

A large and beautiful tree, not before known to occur in the Bahamas. Sargent says that this is one of the handsomest of tropical trees, having brilliant and ample foliage, and bright-colored fruit. The wood is not useful.

being light and soft, but from the bark is obtained the medicinal drug, quassia. This tree has not been found in the Bahamas except where we collected it at the junction of Soldiers road and the Blue Hills road, New Providence. It occurs in Florida, Cuba, Jamaica, Nicaragua and Brazil. (Jessup Coll.)

BURSERA SIMARUBA (L.) Sarg. (Gum-elemi).

A good-sized tree with very soft and spongy wood. From it is obtained the "gum-elemi" of commerce, used in medicine and for varnish. Branches of this tree when cut off and stuck in the ground will take root and grow in the most barren soil. We saw a row of them, thus planted, flourishing on the sand dunes at Governors Harbor, Eleuthera. It is found on New Providence, Andros, Abaco, Eleuthera, Long, Cat and Watlings Islands, in south Florida, and most of tropical America. (Jessup Coll.)

In addition to the above-mentioned medicinal plants, there are a great many others that are used by the negroes for various complaints. Some of the more commonly used are the following: *Ipomea pes-capræ* Sw. (Bay hop), *Tetrazygia bicolor* (Mill.) Cogn. (Wild Guava), *Phyllanthus epiphyllanthus* L. (Hardhead), *Bourreria havanensis* (L.) Miers (Strong-back), *Cordia bahamensis* Urban (Granny-bush), *Turnera ulmifolia* L. (Buttercup), *Bryophyllum pinnatum* (Lam.) S. Kurz (Live-forever), *Pluchea odorata* (L.) Cass. (Sour-bush).

INDIGENOUS FRUITS.

The indigenous flora of the Bahamas has contributed no fruits that have proved worthy of cultivation. The best of them are hardly equal to our persimmon, and most of those given below are included only because they are considered edible by the natives.

CHRYSOPHYLLUM OLIVIFORME Lam. (Damson Plum, Wild Star-apple, Saffron).

A tree 20 to 25 feet high, of the same genus as the cultivated star-apple (*Chrysophyllum cainito* L.). Wood hard, heavy, valued for charcoal-making. We did not see the fruits and know nothing of its quality except that it is said to be edible. New Providence, Andros and many of the West Indies. (Jessup Coll.)

TETRAZYGIA BICOLOR (Mill.) Cogn. (Wild Guava, Naked Wood).

A small tree or shrub. The wood is said to have been used for gin rollers when cotton was an important product of the Islands. The fruit is considered edible. New Providence, Andros, Abaco and Long Islands; also in Cuba.

Reynosia septentrionalis Urban (Darling Plum, Dorlin Plum).

A small tree or shrub with hard and heavy wood. The fruit is about the size of a plum, blue-black in color, and of a pleasant taste when fully ripe. The first account of this plant was by Catesby, who found it on New Providence, and figured it under the name of "Bullet-bush." It is plentiful on New Providence and most of the other islands, and is also found in southern Florida, Cuba and the Virgin Islands. (Jessup Coll.)

Chrysobalanus icaco L., and Chrysobalanus fellocarpus Meyer (Cocoa Plum, Pigeon Plum).
Plate XLIII, Fig. 1.

There are two forms of the cocoa plum, the one with light pink, the other with black fruit. Until recently these were both included under *C. icaco* L., but the black-fruited form is now known as *C. fellocarpus* Meyer. Both forms are abundant along the shores of most of the islands, and they often grow together. The wood is heavy and strong, but is little used. The plant is usually of shrubby growth, but a specimen of the black-fruited variety 25 feet high was seen on Watlings Island. The fruit is the size of a large plum and makes a very good preserve. It may also be eaten raw, but is astringent unless perfectly ripe. It was a favorite fruit with the Carib Indians. The seeds are also edible. They are very oily, and Sargent says that strung on sticks they are used as candles by the natives. The astringent root and bark are of medicinal value. The cocoa plum occurs in southern Florida and is widely distributed in tropical countries. (Jessup Coll.)

Coccolobis uvifera (L.) Jacq. (Sea-grape).
Plate XLII, Fig. 2.

A scrubby tree of contorted growth found along sandy beaches on all of the Islands. The fruit is borne in long grape-like clusters, and, though astringent, is edible when quite ripe. The wood is hard, takes a good polish, and is sometimes used in cabinet-making. Found also in southern Florida and in most of tropical America. (Jessup Coll.)

Hypelate trifoliata Sw. (Red-wood, Ebony).

A small tree generally, but reaching a height of 40 feet on Andros. This is not the true Ebony and the wood is not used, but the fruit is said by Sargent to possess a sweet and rather agreeable flavor. It occurs on New Providence, Andros and Long Island, and is also found in southern Florida, Cuba and Jamaica. (Jessup Coll.)

BYRSONIMA LUCIDA Rich. (Sweet Margaret).

Usually a low shrub, but reaching 20 feet on Andros. Its rosy flowers, changing to purple as they develop, make this a very attractive plant. The greenish fruit has a pleasantly acid flavor. The plant is common on New Providence, Andros and Abaco, and a few specimens were seen on Cat and Watlings Islands. It also occurs in southern Florida, as well as in Cuba and some of the other West Indian Islands.

MALPIGHIA POLYTRICHA Juss. (Touch-me-not).

A shrub with stinging hairs on the leaves, whence the name. The pulpy fruit is about the size of a large cherry. Found on New Providence, Andros, Eleuthera and Cat Islands, and on Haiti.

BUNCHOSIA GLANDULOSA (Cov.) Rich. (West Indian Cherry).

A good-sized shrub with pretty, yellow flowers, and fruit the size of a plum. Occurs on New Providence, Eleuthera and Long Islands, in the West Indies and South America. Not common in the Bahamas.

BUMELIA LORANTHIFOLIA (Pierre) Britton (Milk Plum or Saffron).

A bushy shrub with dark, edible fruit about the size of a cherry. It is common on New Providence, Andros, Abaco and Eleuthera, and is found in southern Florida, Texas and Cuba.

CULTIVATED FRUITS.

In comparison with Jamaica, Cuba and many of the other West Indies, the number of fruits cultivated in the Bahamas is very small. This is probably due in large measure to the very restricted range of soil and climatic conditions in the latter group. We give below only those fruits that were actually seen by us; many others are given by Gardner, Brace and Dolley as cultivated in the Bahamas, and isolated specimens of most of them may no doubt still be found in gardens and door-yards.

COCOS NUCIFERA L. (Cocoanut Palm).

Plate XXVI, Fig. 2, and Plate LXXXV, Fig. 2.

One of the commonest trees in the Bahamas. It is partial to sandy soil near the sea, but unless some cultivation is given the fruit is of inferior size.

PHŒNIX DACTYLIFERA L. (Date Palm).

This fine palm was seen only on New Providence and on Watlings Island. It is said to occasionally ripen its fruit in Nassau.

Ananas sativus Lindl. (Pineapple).

Plate XXV, Fig. 2.

The pineapple is grown on most of the islands, and exported fresh or canned.

Musa sapientum L. (Banana).

Plate XXVI, Fig. 1.

Bananas are grown in suitable pot-holes in the settlements throughout the Bahamas.

Musa paradisiaca L. (Plantain).

Plantains are grown in most available pot-holes, but the fruit is not exported.

Artocarpus incisa L. (Breadfruit).

Fruit and seeds both edible when roasted. Gardner, Brace and Dolley say that the bark, which is very tough, is beaten out into fine, white cloth by the natives of Tahiti and other islands of the Pacific. A tough gum, useful for calking boats, can be made from the sap.

Ficus carica Willd. (Fig).

The edible fig is rare in the Bahamas, and we did not hear of it except in Nassau.

Anona squamosa L. (Sweetsop or Sugar Apple).

A small tree seen only at Nassau. The fruit is fairly agreeable, but cannot compare with the mango.

Anona muricata L. (Soursop).

A somewhat larger tree than the sweetsop. The fruit is pleasantly acid and makes a refreshing drink with sugar and water.

Persea persea (L.) Cockerell (Avocado Pear).

A good-sized tree with pear-shaped fruit that is highly esteemed. I have seen this fruit in the New York markets, but it is not exported from the Bahamas. The tree is common around Nassau and in other settlements.

Tamarindus indica L. (Tamarind).

Plate XXX, Fig. 1.

When in full foliage the tamarind, with its delicate, compound leaves, is a very handsome tree, and it is a favorite on Nassau lawns. The pulp of the long fruit makes a very pleasant conserve.

FIG. 1.—VEGETATION OF A FRESH WATER MARSH WITH THATCH PALM (INODES PALMETTO) IN CENTER, NEW PROVIDENCE

FIG. 2.—FOREST SHOWING PINES WITH "MAY-POLE" FERN (PTERIDIUM CAUDATUM) BENEATH, ABACO

VIEWS ILLUSTRATING VEGETATION

CITRUS AURANTIUM L. (Orange).

CITRUS RACEMOSUS R. & P. (Grapefruit).

CITRUS DECUMANA Lour. (Shaddock).

CITRUS SPINOSISSIMA Meyer (Lime).

CITRUS LIMOSUM Ress. (Lemon).

All of the above citrus fruits, except the lemon and shaddock, are commonly planted and exported in greater or less quantities. Lemons are rarely seen.

SPONDIAS PURPUREA L. (Red Plum).

This tree was seen only in Nassau, where its fruit is sold on the streets.

MANGIFERA INDICA L. (Mango).

This tree, when the best varieties are secured, yields one of the few tropical fruits of real excellence that is not common in our markets. It is freely planted about Nassau, and may be found on most of the Out-islands.

BLIGHIA SAPIDA Koen. (Akee).

A fine tree, but by no means common in the Bahamas. The fleshy, yellow arillus of the seed is very good when cooked, but over-ripe fruit should be avoided, as it has been known to produce poisoning.

MELICOCCA BIJUGA L. (Genipe).

A large tree with compound leaves and plum-like fruits produced in clusters. It is a common plant in Jamaica, but is rare in the Bahamas. We found it escaped in the low coppice east of Nassau.

MAMMEE AMERICANA L. (Mammee).

A tall, handsome tree, with large russet-colored fruit of rather poor quality. It is not much planted except around Nassau.

CARICA PAPAYA L. (Papaw).

Plate XXXIII, Fig. 2.

This interesting plant is often seen in Bahama door-yards, and the natives seem fond of its fruit. To most visitors, however, it is far from attractive. The juice of the unripe fruit contains a digestive ferment which acts on meats and is often employed in place of pepsin.

PUNICA GRANATUM L. (Pomegranate).

The pomegranate is easily grown in the Bahamas, and its ornamental fruits and flowers make it a popular shrub in Nassau gardens.

TERMINALIA CATAPPA L. (Almond).

Plate XXXIV, Fig. 1.

A rather small tree with large, thick leaves that is common on the streets and landings of Nassau. This is not the true almond, but the fruit has an edible kernel. The tree is most valued for ornament and shade.

ACHRAS SAPOTA L. (Sapodilla).

A good-sized tree with russet-colored fruit that is very popular in the West Indies. It is freely cultivated on New Providence and most of the other islands of the Bahama group.

TREES CULTIVATED FOR ORNAMENT.

Some of the most common of these are the following:

MELIA AZEDARACH L. (China Tree).

A very attractive small tree of the same family as mahogany. The yellow wood takes a fine polish and has been used for interior work. The fruit is liked by animals and is useful as a vermifuge for horses. Sparingly naturalized.

FICUS SAPOTIFOLIA Kunth and Benche (Tree fig).

Plate XXXIV, Fig. 2.

The conspicuous fig tree at "Thomson's folly," near Nassau, is of this native species and not *Ficus bengalensis* L., the true banyan of India. Other native arboreal figs, such as *Ficus jacquinifolia* Rich. are well worthy of cultivation. The seeds of many species of *Ficus* often sprout on the trunks and branches of other trees and, sending down long roots to the ground, grow to such an extent as to destroy and supplant the host.

CÆSALPINIA PULCHERRIMA Sw. (Pride of Barbados).

A small tree closely related to the poinciana and, like it, a profuse and brilliant bloomer. It may be found in Nassau, but is not so freely cultivated as the poinciana.

ROYSTONIA REGIA (H. B. K.) O. F. Cook (Royal Palm).

Plate XXXV, Fig. 1.

This is one of the most beautiful of palms and grows to perfection in Nassau. It was introduced from Cuba.

POINCIANA REGIA (Boj.) Raf. (Royal Poinciana).

Plate LXXXIII, Fig. 2.

A small tree which when in full flower can scarcely be equalled for magnificent display. Its decorative value has secured for it a conspicuous place in most of the streets and gardens of Nassau.

HURA CREPITANS L. (Sand-box Tree).

Plate XXXVI, Fig. 2.

A low tree with a dense, rounded top, much used for street planting. As in so many other members of this family, the juice is very poisonous, but the wood is used in some countries for making canoes and for interior work.

THESPESIA POPULNEA Corr. (Sea-side Mahoe).

This is another favorite shade tree on Nassau streets, where its large leaves and showy flowers give it ornamental value.

CEIBA PENTANDRA (L.) Gaertn. (Silk-cotton Tree).

Plate LXXXVIII.

This is one of the most striking of all tropical trees. Its great spreading top, and immense trunk, flanked on all sides with buttresses, has won for it the admiration of all travelers. There are some very fine specimens in Nassau, but the old tree near the Postoffice, shown in the illustration mentioned above, is perhaps the most perfect example of its peculiar growth. This tree is said to have been brought from South Carolina and to have given rise to all the others on the island.

CASUARINA EQUISETIFOLIA Forst. (Spanish Cedar).

This peculiar Australian tree grows to a great size in Nassau. Several fine specimens may be seen along the street in front of the Postoffice square. It is cultivated on most of the islands and has become naturalized in several places.

ALBIZZIA LEBBEK Benth. (Woman's Tongue).

Plate LXXXVI, Fig. 1.

A low, widely spreading tree that is much planted for shade. Its thin pods, when dry, keep up a constant rattling, whence the common name.

In addition to these, most of the trees mentioned as cultivated for their fruits are also of ornamental value.

Among the cultivated shrubs, the following are often seen: *Plumiera rubra* L. (Frangipani), *Thevetia thevetia* (L.) Millsp. *Nerium oleander* L. (Oleander), *Codiæum variegatum* Blume (Croton), *Erythrina crista-galli* L. (Cock's-spur), *Lagerstrœmia indica* L. (Crape Myrtle), *Gardenia jasminoides* Ellis (Cape jessamine), *Punica granatum* L. (Pomegranate), *Hibiscus rosa-sinensis* L., *Tamarix gallica* L. (Tamarisk), *Viburnum opulus* L. (Snowball tree), *Tecoma stans* Juss. (Yellow elder).

Space does not permit the enumeration of the many other cultivated shrubs, vines and herbs, but one might mention the magnificent *Bougainvillea spectabilis* Poir., shown in Plate I, and the scarcely less attractive *Antigon leptopus* H. and B.

BOTANICAL FORMATIONS IN THE BAHAMA ISLANDS.

To one accustomed to the grandeur of the forests of the United States and to the fresh and varied greens of our vegetation the impression produced by the low, monotonous growth of the Bahama Islands is distinctly disappointing. The color scheme is a dull, grayish-green, relieved occasionally, it is true, by dashes of brilliant color, such as scarlet, yellow, white, from plants in flower, but lacking power to attract and charm the eye. Standing on the top of the Blue Hills and looking northward towards Nassau (Plate XXV, Fig. 1), one sees the flaming crowns of the poinciana like burning coals in a bed of ashes; all else is subdued. The Bahamas also lack the fascination of the fern-clad mountains of Jamaica, where the delicate and water-loving species grow with a profusion that can scarcely be realized. For in these Islands there are no mountains, valleys, running streams, or fresh and quiet waters. Here nature does not seem so diverse, and the opportunities she offers for a varied life are restricted on every side by the rocky, calcareous soil and salt-laden wind.

But, on the other hand, the rigor of such conditions and the necessity of meeting them have brought about corresponding adaptations of habit and structure in the vegetation that are of the greatest interest to students of plant life. Space does not permit even a bare mention of the diverse means by

which the heat, salt, and wind are resisted and the difficulties of living solved; but some of the most noticeable may be referred to. The beach plants are particularly liable to be uprooted or buried by the shifting sand, and to meet this danger they are nearly always furnished with vegetative means of propagation, either by underground rhizomes (many grasses, as *Uniola, Sporobolus*), prostrate creeping branches which root at the nodes (*Ambrosia hispida* Pursh, *Distichlis maritima* Raf.), or recurved branches which root at their tips (*Tournefortia, Scævola*). Plate XLIV, Fig. 1, illustrates this habit. If one part is covered or uprooted another may continue the growth. Beach plants are also apt to have more or less succulent leaves, which are either polished or reflect the intense light (*Borrichia glabra* Small, *Scævola*), or hairy, to prevent too rapid evaporation (*Borrichia argentea* DC., *Tournefortia*), or the leaves may be hard, narrow, and inrolled (many grasses and sedges, *Rhacicallis, Suriana, Jacquinia*). The epidermis is generally very thick and the stomata are protected in various ways.

The scrubby coppice growth that makes up the greater part of the vegetation contains remarkably few succulent plants. There are no yuccas, few cacti, and but one species of agave.

The conditions, however, are generally arid; the porous rock drains quickly and there are often periods of excessive drought. The leaves are as a rule hard, and grayish in color from the presence of hairs or wax. In many species the young leaves hang vertically and are protected by rusty hairs. In *Langeria densiflora* (Griseb.) B. & H., a tree found on New Providence, the young leaves are coated with a kind of lacquer which, in dry weather, becomes very hard, and effectually prevents evaporation.

The plants of salt marshes and mangrove swamps possess many interesting and peculiar adaptations. In the case of *Rhizophora mangle* L. (Plate XLI, Fig. 1, and Plate LXXXIV, Fig. 2) the old leaves become much thicker and change their function from photosynthesis to water storage. The adventitious roots descend from the branches and, taking hold of the mud, extend the plant indefinitely. The fruits of this species germinate on the tree and are for a long time nourished by the parent plant. When they finally fall they float in the water root downwards, and on coming in contact with the bottom send out with remarkable rapidity the young roots that had already started to grow beneath the epidermis. *Avicennia nitida* Jacq., another mangrove plant, sends up from its underground roots others that rise perpendicularly out of the ground for a foot or more. These aerial roots, as

well as the underground ones, are very spongy, and the air taken in through their large lenticels can easily pass to the subterranean parts. The leaves of this plant secrete large quantities of salt, which collects in crystals on the surface.

In regard to the dispersal of seeds, there is a marked difference between the plants of the Bahamas and those of the United States. In the former there is a great preponderance of plants bearing fleshy fruits, *i. e.*, fruits adapted for distribution by birds, rather than those with hairy, winged, or barbed seeds and fruits fitted for transportation by the wind or by clinging to the hair of animals.

Of plants with barbed seeds or fruits we found only three species—*Petiveria alliacea* L., a common weed about Nassau; *Pavonia spinifex* Cav., a clambering shrub, and *Meibomia supina* (Sw.) Britton, a low herb. Those with seed for wind distribution are the epiphytic *Tillandsias* and *Orchidaceæ*, most of the *Compositæ*, *Typha*, *Swietenia*, *Casuarina*, and a few others. A number of beach plants produce seeds which are able to float for a long time without being damaged by the salt water, and these may thus become distributed over great distances through the movements of ocean currents.

PLANT FORMATIONS.

We will now pass to a systematic consideration of the various plant formations of the islands which were visited by the Expedition.

NEW PROVIDENCE.

In describing the vegetation of this island, we shall begin at the south shore, at the point where the South-side road meets the beach, and take up the formations observed in crossing to the north side.

Sand-strand Formation.—The south side of New Providence differs from the north side in its more regular and more sandy beaches, and it presents the typical sand-strand formation of tropical shores. At certain points along this exposure there are large areas of shoal water stretching out for hundreds of yards from the beach where the depth seldom exceeds a foot. Occupying this area is an open growth of *Avicennia nitida* Jacq., of stunted and contorted habit and with a height not often exceeding 2 or 3 feet. At high tide the smaller plants are almost covered with water. The appearance of these shrubs is well shown in Plate XLVII, Fig. 2. Along this southern coast the sand-strand formation may be divided, beginning seaward, into the five following associations:

Fig. 1.—TYPICAL HIGH COPPICE IN THE INTERIOR OF NEW PROVIDENCE

Fig. 2.—MIXED GROWTH OF PINES, SILVER PALMS (THRINAX BAHAMENSIS) AND DECIDUOUS TREES, NEW PROVIDENCE

VIEWS ILLUSTRATING VEGETATION

1. *The Ipomea pes-capræ Association.*—Here the *Ipomea* itself is by no means abundant, occurring only rarely at considerable intervals, but the association corresponds to the Ipomea association of other tropical shores. At points where the *Ipomea* does not occur, its place is taken by the grasses, *Paspalum vaginatum* Sw. and *Sporobolus virginicus* Kunth. This grass strip varies in width from 1 to 10 feet, beginning at high water mark and running back the greatest distance where the next association is broken. The two grasses occurring here are both good sand-binders. *Paspalum* has thick trailing branches with leaves in tufts at the nodes, while *Sporobolus* has underground runners with closely tufted upright branches (Plate XLVII, Fig. 1).

2. *The Uniola-Tournefortia Association,* following the above, occupies the gently sloping, or in some places quite level, sandy strip that extends to the scrubby coppice behind. At the point where these observations were taken its width was from 3 to 12 feet. *Uniola paniculata* L. is not present at all points, but is scattered at intervals, sometimes in dense, pure growth, but frequently more open. Where the *Uniola* is absent, or scattered, its place is taken by large clumps of *Tournefortia gnaphalodes* R. Br. and *Scævola plumieri* L. mixed with *Suriana maritima* L., *Salmea petrobioides* Griseb., *Strumpfia maritima* Jacq., and a little *Borrichia glabra* Small (or *B. argentea* DC.). The aromatic *Ambrosia hispida* Pursh occupies open spots in this association and penetrates more or less into the scrub behind. Its prostrate branches are often 10 or 12 feet in length, with upright shoots reaching a height of 6 to 12 inches. *Sesuvium portulacastrum* L. occurs here also, but is not so abundant as *Ambrosia*. Its fleshy procumbent stems reach a length of 6 feet, and from every node are produced short lateral branches of a rather definite length. These also lie flat, except at the tips, which are turned upward, but they rarely root and may be characterized as "kurtztriebe." The main stems do not take root at every node but only at intervals of about 2 feet.

3. *Pithecolobium-Salmea Association.*—This begins immediately behind the association last mentioned. Its principal plants are *Pithecolobium keyense* Britton (Ram's horn), *Salmea petrobioides* Griseb., *Torrubia longifolia* (Heimerl) Britton (Blolly), *Jacquemontia jamaicensis* (Jacq.) Hall, *Erithalis fruticosa* L. (Black torch), *Lantana involucrata* Sw. (White lantana), *Ernodea littoralis* Sw., and *Solanum bahamense* L. (here without spines on the leaves), with an occasional tuft of *Cyperus brunneus* Sw. The scrubs of this formation are low and dwarfed, generally not more than 3 feet high. They

occupy the outer slope of the low ridge of wind-blown sand that skirts the shore. As the crest of this ridge is approached, the sand becomes mixed with a little more humus and there is a rather sudden transition into the higher growth of the next association.

4. *Erithalis-Reynosia (or littoral sand-coppice) Association.*—This occupies the flat top, not often over 12 or 15 feet wide, of the sand ridge just mentioned, and the growth averages about 8 feet, rarely reaching 12 feet in height. Most of the plants mentioned in this last association occur here also, but the principal constituents are *Erithalis fruticosa* L. (Black torch), *Reynosia septentrionalis* Urban (Darling plum), *Metopium metopium* (L.) Small (Poison-wood), *Torrubia longifolia* (Heimerl) Britton (Blolly), *Salmea petrobioides* Griseb., *Rapanea guianensis* Aubl. (Beef-wood), and *Ilex krugiana* Loes. *Genipa clusiæfolia* Griseb., *Acacia choriophylla* Benth. (Cinnecord), *Bumelia loranthifolia* (Pierre) Britton (Milk plum), *Bourreria havanensis* (L.) Miers (Strong back), *Bumelia microphylla* Griseb. (Ink-berry), and *Uniola racemiflora* Trin. are less commonly present.

5. *The Silver Palm Association* covers the inner slope of the ridge and extends to the edge of the marshy depression behind. As the name implies, the silver palm is the character growth here. Its height varies from 8 to 14 feet and it is by far the most conspicuous plant of this area. Of the undergrowth, *Uniola racemiflora* Trin. is most abundant. Mixed with it are dwarf specimens of *Pithecolobium keyense* Britton, *Torrubia longifolia* (Heimerl) Britton, *Salmea petrobioides* Griseb., *Erithalis fruticosa* L., *Rapanea guianensis* Aubl., *Bourreria havanensis* (L.) Miers, *Lantana involucrata* Sw., *Ernodea littoralis* Sw., *Corchorus hirsutus* L., *Reynosia septentrionalis* Urban, *Cordia bahamensis* Urban, and *Metopium metopium* (L.) Small.

Fresh-marsh Formation.—This occupies a long depression behind the beach where the soil is saturated or entirely covered with shallow water. Thatch palms (*Inodes palmetto* (Walt.) Cook) are abundant on the damp margins of the marsh and a few also penetrate into the shallow water. *Cladium effusum* Torr., *Willughbæya heterophylla* Small, *Centella repanda* (Pers.) Small, the attractive, white-flowered *Sabbatia companulata* (L.) Britton and *Ipomea sagittata* Cav., with large purple flowers, are also common as marginal plants. Further out large clumps of *Anona palustris* L. (Custard apple) appeared, and a little *Rhizophora mangle* L. (Mangrove) in deeper places gave evidence that the water was not quite fresh. This formation is about one-half mile wide and passes northward into the next.

PINE-BARREN FORMATIONS.—The pine-barrens of New Providence may be divided into two distinct formations, the Wet-barrens and the Dry-barrens. For the character of the soil the reader is referred to the section on Bahama Stony-loam in the chapter on Soils of the Bahama Islands.

1. *The Wet-barrens*, into which the fresh marsh passes to the northward, are about three-quarters of a mile in width at the point where they are crossed by the South-side road. The ground, which is composed of more or less honeycombed rock, is not wet except in depressions, but the water is constantly within a few inches of the surface. The formation differs from the typical pine-barrens in the occurrence of the *Inodes palmetto* (Walt.) Cook (Thatch palm), and differs from the wetter marsh in the occurrence of the pine. It is intermediate ground where the pines and palms intermingle. The larger growth, which consists almost entirely of these two trees, is open and scattered; the slender pines reach a height of 20 to 35 feet; the palms of 15 to 20 feet. A few small specimens of *Metopium metopium* (L.) Small, *Exostemma caribæum* (Jacq). R. & S. and *Coccolobis laurifolia* Jacq. are scattered here and there, but they rarely reach the dignity of trees. The undergrowth is low and open, and its principal shrubby components are *Corchorus hirsutus* L., *Pithecolobium keyense* Britton, *Torrubia longifolia* (Heimerl) Britton, *Tecoma bahamensis* Northrop, *Lantana involucrata* L., *Cordia bahamensis* Urban, *Byrsonima lucida* (Sw.) DC., and *Bourreria havanensis* (L.) Miers. The vines, which form a very conspicuous part of the plant covering, are *Willughbaya heterophylla* Small, *Smilax beyrichii* Kunth, *Rhabdadenia sagræi* (A. DC.) Small, *Rajania hastata* L., and the parasitic *Cassytha filiformis* L. *Turnera ulmifolia* L., *Evolvulus sericeus* Sw., *Lippia stœchadifolia* Kunth, *Dccromena colorata* Hitch. (the "showy sedge"), *Chloris petræa* Thunb., and a species of *Andropogon* are the principal herbaceous species. Here and in the next formation the little fern *Ornithopteris adiantoides* (Sw.) Presl. is most at home.

2. *The Dry-barrens*, into which the above formation passes, extend across the central part of the island to the base of the Blue Hills, a distance of about 5 miles. The pines rarely reach a large size, being generally slender and from 20 to 35 feet high. Occasionally, however, a much larger specimen is seen (Plate XXXV, Fig. 2). *Coccothrinax jucunda* Sarg. (Silver-thatch palm) is, next to the pine, the most conspicuous and abundant tree. It is occasionally 12 feet high, but generally smaller. As undergrowth, the following plants are dominant: *Metopium metopium* (L.) Small

(Poison-wood), *Rapania guyanensis* Aubl. (Beef-wood), *Tecoma bahamensis* Northrop, *Petetia pappigii* Schan., *Duranta plumieri* Jacq. (Wild bittersweet), *Fagara coriacea* (A. Rich.) Kr. & Urb. (Hercules club), *Acacia choriophylla* Benth. (Cinnecord), Cassia sp., *Tetrazygia bicolor* (Mill.) Cogn. (Wild guava), *Ascyrum hypericoides* L., *Cordea bahamensis* Urban, *Pithecolobium keyense* Britton (Ram's horn), *Ernodea littoralis* Sw., *Vernonia bahamensis* Griseb., *Turnera ulmifolia* L., *Rajania hastata* L. (Wild yam), *Smilax beyrichii* Kunth, *Setaria glauca* (L.) Scribn., *Decromena colorata,* and the tough fern, *Pteridium caudatum* (L.) Kuhn. In rock holes, which are abundant, the orchid *Bletea verecunda* Sw. is common. As the foot of the Blue Hills is approached, the pine-barrens terminate abruptly and the next formation begins.

COPPICE FORMATIONS.—As in the case of the pine-barrens, the coppice growth of New Providence may be divided into two rather distinct formations—the High-coppice and the Low-coppice.

1. *High-coppice.*—This covers the southern slope of the Blue Hills, and parts of the northern slope, particularly to the west of Nassau. The soil is composed of porous rocks, rather soft, and filled with innumerable excavations of all sizes. It is of the type described as Bahama black-loam in the chapter on Soils of the Bahama Islands. As an example of the plant covering of this formation, we shall take that section of growth at the junction of the Blue Hills road and Soldiers road, about three miles south of Nassau. A photograph of this spot is reproduced in Plate XXVII, Fig. 2. There is considerable soil of dark, sandy loam covering the rocks, and the trees stand close together. There is very little undergrowth on the densely shaded ground. The principal woods growing here are *Coccolobis laurifolia* Jacq. (Pigeon plum), *Rapania guyanensis* Aubl. (Beef-wood), *Swietenia mahogani* Jacq. (Mahogany), *Bursera simaruba* (L.) Sarg. (Gum-elemi), *Metopium metopium* (L.) Small (Poison-wood), *Lysiloma latisiliqua* (L.) Benth. (Wild tamarind), *Ilex krugiana* Loes., *Ilex repanda* Griseb., *Simaruba glauca* Kunth, *Lucuma multiflora* A. DC. (Wild mammee), *Pera humeliæfolia* Griseb., *Erythroxylon brevipes* DC. (Sareto), *Acacia choriophylla* Benth. (Cinnecord), *Thouinia discolor* Griseb. (Red-wood), *Tecoma bahamensis* Northrop, *Isacoria paniculata* (Nutt.) Sudw. ("Maple"), *Exothea paniculata* (Juss.) Radlk. (Butter-bough), and *Amyris elemifera* L. (White torch). The largest tree in this coppice was the wild tamarind. Specimens were 2 feet 6 inches in diameter at base, and 35 feet in height, with large, wide-spreading tops. Next to it in size was *Simaruba*

glauca Kunth, with a diameter of 18 inches and a height of 40 feet. Almost as large was *Pera humeliæfolia* Griseb. and *Swietenia mahogani* Jacq., with a diameter of 1 foot and a height of 35 feet. The mahogany was badly ringed with sapsucker holes and it was also the only tree attacked by *Phorodendron*. Cinnecord, butter-bough and *Tecoma*, which are generally low and scrubby, were here tall and slender, with a height of 20 to 25 feet.

2. *Low-coppice Formation.*—This covers most of the northern slope of the Blue Hills and a large part of the flat country on the north and east sides of the island. In a drive from Nassau to Mt. Vernon and around by Village road and Wolf road one passes through a typical low coppice growth. The soil is Bahama black-loam of the variety known as "plate rock," discussed in the chapter on the Soils of the Bahama Islands. A few trees, such as *Bursera simaruba* (L.) Sarg. (Gum-elemi), *Metopium metopium* (L.) Small (Poison-wood), *Dipholis salicifolia* A. DC. (Wild cassada), and *Swietenia mahogani* Jacq. (Mahogany), project occasionally above the general level, but even these are much smaller than in the High-coppice. The average height of the covering is about 10 to 15 feet, and a great variety of species struggle with each other here for the scanty sustenance that the rocks afford.

Among the small trees and scrubs, which are the predominant growth, the following are common: *Exothea paniculata* (Juss.) Radlk., *Bourreria havanensis* (L.) Miers, *Coccolobis laurifolia* Jacq., *Hypelate trifoliata* Sw., *Bumelia loranthifolia* (Pierre) Britton, *Savia bahamensis* Britton, *Erithalis fruticosa* L., *Hæmatoxylon campechianum* L., *Picramnia pentandra* Sw., *Byrsonima lucida* (Sw.) DC., *Macreightia caribæa* A. DC., *Anastraphia northropiana* Greenm., *Tecoma bahamensis* Northrop, *Torrubia longifolia* (Heimerl) Britton, *Torrubia obtusata* (Jacq.) Britton, *Psychotria undata* Jacq., *Ocotea catesbyana* (Michx.) Sarg., *Fagara fagara* (L.) Small, *Duranta repens* L., *Leucæna glauca* (L.) Benth., and *Krugiodendron ferreum* (Vahl.) Urban. *Helicteres spiralis* Northrop, *Melicocca bijuga* L. and *Croton eleuteria* Sw. are less often seen.

The principal vines are *Triopteris rigida* Sw., *Jacquemontia jamaicensis* (Jacq.) Hall, *Smilax beyrichii* Kunth, *Smilax havanensis* Jacq., and *Smilax oblongata viscifolia* (Derham.) Schulz. The long, yellow threads of the parasitic *Cassytha filiformis* Jacq. often cover and greatly injure the other growth. It was only in this formation that we found *Vanilla articulata* Northrop on New Providence. Its succulent stems were sometimes rooted and sometimes not. In the latter case it lives entirely as an epiphyte.

Salt-marsh Formation.—Near the foot of the north slope of the Blue Hills and directly south of Nassau, the Low coppice is interrupted by a large tract of marshy land in the center of which is a considerable pond of water. This rises and falls with the tides and is almost as salty as the sea itself. The soil consists of honeycombed rocks, with edges so sharp that walking is difficult. Within the innumerable crevices there is a deposit of soft, sticky, white ooze, described in the chapter on Soils of the Bahama Islands as "brackish swamp marl," which to all appearances is as barren as the rock itself. On the edges of the pond this ooze completely covers the rock, and the conditions for plant growth are here so unfavorable that only the extremely resistant *Aster tenuuifolius* L. and *Distichlis maritima* Raf. have gained a footing. Both of these species have long rhizomes running an inch or two under the surface and sending up aerial shoots at the nodes. They cover the soil rather closely in places, but are absent in others. Behind these where the honeycombed rock is exposed is an exceedingly dwarfed and prostrate growth of *Conocarpus erecta sericea* Fors. and *Rhacicallis maritima* (Jacq.) Schum. Their gnarled and contorted stems run like snakes among the knife-like edges of the rocks. But in spite of all discouragements, these plants were bearing fruit, even when less than 6 inches in height. Even here the parasitic *Cassytha* was running along the rock from plant to plant and attacking everything in its way. Further from the margin of the water other low scrubs began to appear, still much dwarfed, but not so prostrate. Among these were *Torrubia longifolia* (Heimerl) Britton (Blolly), *Bumelia microphylla* Griseb. (Ink-berry), *Jacquinia keyense* Mez. (Joe-bush), and *Mimusops sieberi* A. DC. (Wild sapodilla). The two grasses, *Uniola paniculata* L. and *Uniola racemiflora* Trin., also found a place here, and several species of *Tillandsia* attached themselves to the shrubbery, even in the most exposed situations (Plate XL, Fig. 2). On the eastern end of the marsh, where conditions were more favorable to growth, the *Conocarpus* reaches 15 feet in height, and *Iva cheiranthifolia* Kunth, and *Cladium effusum* (Sw.) Torr. appear in considerable abundance. Near the outer edges of the marsh the *Coccothrinax jucunda* Sarg. (Silver-thatch palm) forms a conspicuous fringe and at about this point the ordinary low coppice growth comes in.

The vegetation of the fresh marshes that extend for some distance along the north shore just behind the beach to the west of Nassau, is very similar to what has been already described for similar situations on the south side, but some plants were common here that were not found on that side. Among

FIG. 1.—LOGWOOD TREE (HAEMATOXYLON CAMPECHIANUM), CURRENT SETTLEMENT, ELEUTHERA

FIG. 2.—FIG TREE (FICUS JACQUINIFOLIA) IN CENTER, MANGROVE CAY, ANDROS

VIEWS ILLUSTRATING VEGETATION

them may be mentioned *Myrica cerifera* L., *Baccharis angustifolia* Michx., and *Sagittaria lancifolia* L. Plate XXXVII, Fig. 1, is a view of a fine *Inodes palmetto* (Walt.) Cook (Thatch palm) standing in one of these fresh marshes on the north side.

ROCKY-SHORE FORMATION.—The north shore of New Providence differs from the south shore in the occurrence of exposed rocks at many places. These rocks are at some points precipitate; at others they form a gentle slope, and in such places are apt to be covered for some distance with a coating of sand next to the sea. In such sandy situations the vegetation is very similar to that of the south beach; but where the rocks are exposed there is an abrupt change. In many places the exposed rocks are covered with a dense growth of *Rhacicallis maritima* (Jacq.) Schum, and *Suriana maritima* L. in pure association, the sand-strand plants being entirely absent. Behind the *Rhacicallis* and *Suriana* is *Coccolobis uvifera* (L.) Jacq. and the attractive white-flowered *Genipa clusiæfolia* (Jacq.) Griseb. Following these and extending slightly into them are found the ram's horn, darling plum, blolly, jack-bush, wild lime and other littoral coppice plants. At places *Hymenocallis arenicola* Northrop forms attractive clumps of bloom.

MANGROVE CAY, ANDROS.

Here for the first time we met with a forest in the Bahama Islands. Passing over a range of hills and down a long slope, we came to a low, irregular country where the growth gradually became higher until it finally passed into what might be called a forest, where the *Lysiloma paucifolia* (DC.) A. S. Hitch. (Horseflesh), *Lysidoma latisiliqua* (L.) Benth. (Wild tamarind), *Fagara coriacea* (A. Rich.) Kr. & Urb. (Doctor's club), and *Hypelate trifoliata* Sw. (Red-wood) reached a height of 40 to 50 feet with a diameter of 2 feet or more. Next to these in size, with a height of 30 to 40 feet, were *Coccolobis laurifolia* Jacq. (Pigeon plum), *Metopium metopium* (L.) Small (Poison-wood), *Ichthyomethia piscipula* (L.) Hitch. (Dogwood), and *Swietenia mahogani* L. (Mahogany). The growth was thick and the shade dense. The floor of rock was deeply excavated and very irregular, and in crevices and depressions were deposits of black-loam, where fleshy fungi were rather abundant. On rotting wood we collected in a few minutes all of the Myxomycetes listed in this report, and there is no doubt that a thorough search would discover a large number of this group on Andros.

On the shoreward side of the hills just mentioned, where an uneven plain

extends to the sand-strand, we found large specimens of the two figs, *Ficus sapotifolia* Kunth & Benche and *Ficus jaquinafolia* Rich., the one with large, the other with small leaves. Both are shown in Plate XXXIX, Fig. 2. Near the base of one of these fig trees was a deep banana hole where the fungi grew. Along the solid walls of this depression the fig roots hung in twisted ropes through circular holes that they had cut in the calcareous rock. Near this point, on the surface of the rocks, grew an abundance of our common *Portulaca oleracea* L. (Purslane), with other plants that are usual in the low coppice. A few hundred feet away, on the slope of the hill, grew *Lysiloma paucifoliola* (DC.) A. S. Hitch. (Wild tamarind), *Swietenia mahogani* L. (Mahogany), *Coccolobis laurifolia* Jacq. (Pigeon plum), *Bursera simaruba* (L). Sarg. (Gum-elemi), *Acacia choriophylla* Benth. (Cinnecord), *Metopium metopium* (L.) Small (Poison-wood), and *Eugenia confusa* DC. (Stopper). None were more than 25 feet in height. On the shore at this point we took a photograph of a fine specimen of *Tournefortia gnaphaloides* (Jacq.) R. Br. which showed to perfection its method of multiplication by off-shoots from the rooting tips of descending branches (Plate XLIV, Fig. 1).

In the shallow water separating Mangrove Cay from Little Mangrove Cay—the latter a very small island, only a few hundred yards from shore—grew *Halophylla engelmanii* Aschers. a delicate aquatic flowering plant of the family *Elodeaceæ* that had not before been found in the Bahamas. With it grew *Coccocladus occidentalis* (Harv.) Cramer, in great quantities, looking like miniature *Myriophyllum*. At other points in the shallow water along the shore we collected *Penicillus capitatus* Lamarck (Mermaid's shaving brush), *Udotea conglutinata* (Ell. & Soland) Lamour, and the curious *Rhipocephalus phœnix* (Ell. & Soland) Kuetz., which stood like toy trees on the sandy bottom. Among them were *Caulerpas* and a number of other sea weeds that are given from Andros in the list.

Off this point the dredge was let down in about 4 fathoms of water and a number of other sea-weeds were secured.

GREEN CAY.

Running east and west near the south side of this island is an elevated ridge which supports a fairly high coppice growth. Between this ridge and the north shore is a low coppice of maritime plants with occasional depressions of marshy areas. The vegetation of these depressions shows brackish conditions, *Conocarpus*, *Avicennia*, *Anona palustres* L., *Cladium effusum* Torr. and

Sesuvium portulacastrum L. being the characteristic growth. A considerable part of the dry area of the low coppice is set with scattered *Coccothrinax jucunda* Sarg. (Silver-thatch palms), some specimens 12 feet high. In lower and damper places the *Thrinax bahamensis* Cook (Goat palm) takes its place. Both of these palms were in bloom during our visit. The flowers of the first had a disagreeable, fetid odor, while those of the second had a pleasant, honey-like fragrance. The latter palm is lower than the first, not often reaching over 6 feet. The low coppice in which these palms were scattered was composed principally of *Pithecolobium keyense* Britton (Ram's horn), *Jacquinia keyensis* Mez (Joe-bush), *Reynosia septentrionalis* Urban (Darling plum), *Colubrina colubrina* (L.) Millsp. (Wild coffee), *Cassia lineata* Sw., and *Antirrhœa myrtifolia* (Griseb.) Urban, the latter with delightfully fragrant flowers. The higher coppice on the hills was of the usual sort, but contained, in addition to the plants ordinarily found on New Providence, *Guaiacum sanctum* L. (Lignum vitæ), which was very attractive with its pretty blue flowers. Covering the barren rocks behind the beach was a low growth of *Ernodea littoralis* Sw., which, unlike any others seen, had white flowers; *Genipa clusiifolia* (Jacq.) Griseb., *Catesbœa fasciculata* Northrop, and *Antirrhœa myrtifolia*. *Passiflora fœtida* L. was growing among these scrubs, and extended in some cases almost to the edge of the water. One specimen was standing perfectly erect in a pocket of sand near the shore. Extending across the bare sand of the beach was *Cassytha filiformis* L., attaching itself to the plants that came in its way. At places where its yellow filaments came into contact with the sand, suckers were produced which caught hold of the soil particles and helped to secure the stems in position. Plate XLVII, Fig. 2, shows the beach on Green Cay with the low coppice in background.

CURRENT SETTLEMENT, ELEUTHERA.

The island at this point is about one-half mile wide and trends approximately north and south. The town is situated on the east side and about a mile below it the island is cut through by a deep current bordered by solid rock cliffs. The west beach is very rocky, but in places there are sandy areas of considerable extent. In one of these sand inlets grew a fine clump of large and small *Inodes palmetto* (Walt.) Cook (Thatch palm). They occupied a marshy depression where they were no doubt able to procure practically fresh water. Between the palms and the beach was a fine garden of *Hymenocallis* in full bloom. Here also grew *Corchorus hirsutus* L.,

Evolvulus arbusculus Poir., with pretty little white, saucer-shaped flower; *Cenchrus tribuloides* L., *Ipomœa pes-capræ* L., and *Euphorbia buxifolia* L. *Suriana maritima* L. also occurred, but *Coccolobis uvifera* (L.) Jacq., *Tournefortia gnaphalodes* (Jacq.) R. Br. and *Scævola plumieri* Vahl. were absent. On the rocky sides of the passage above mentioned grew *Rhacicallis maritima* (Jacq.) Schum., *Erithalis fruticosa* L., *Torrubia longifolia* (Heimerl) Britton, *Conocarpus erecta* L., *Phyllanthus epiphyllanthus* L., *Genipa clusiæfolia* (Jacq.) Griseb., and an occasional clump of *Uniola racemiflora* Trin.

Running north and south near the center of the island is an elevated ridge where the coppice is quite high for Eleuthera. The largest trees of this growth were *Coccolobis laurifolia* Jacq., *Bursera simaruba* (L.) Sarg., and *Sideroxylon mastichodendron* Jacq., the latter reaching 20 feet in height with a base diameter of 2 feet. *Metopium metopium* (L.) Small (Poison-wood) was not seen at any point at this landing, and it is evidently rare in the northern part of Eleuthera.

Near the base of the ridge on the western side were growing a number of specimens of the tall, columnar *Pilocereus lanuginosa* Rumpl., which we here saw for the first time.

Opposite the town the central ridge drops considerably into a slightly elevated, rocky plane, where the covering is of the low coppice type. Here occur *Coccolobis laurifolia* Jacq. (Pigeon plum). *Bumelia loranthifolia* (Pierre) Britton (Milk plum), *Fagara fagara* (L.) Small (Wild lime), *Bursera simaruba* (L.) Sarg. (Gum-elemi), *Torrubia longifolia* (Heimerl) Britton (Blolly), *Bumelia microphylla* Griseb. (Ink-berry), *Picrodendron baccatum bahamense* Kr. and Urb., *Ichthyomethia piscipula* (L.) Hitch. (Dogwood), *Pithecolobium keyense* Britton (Ram's horn), *Acacia choriophylla* Benth. (Cinnecord), and *Hæmatoxylon campechianum* L. (Logwood). The principal vines were *Serjania subdentata* (Juss.) Poir., *Gouania domingensis* L., and *Parthenocissus quinquefolia* (L.) Planch. In sandy places *Lantana crocea* Jacq. and *Lantana involucrata* L. were abundant. The eastern shore is sandy and has the usual growth of such situations as *Iva imbricata* Walt., *Coccolobis uvifera* (L.) Jacq., *Cenchrus tribuloides* L., *Euphorbia buxifolia* L., etc.

SPANISH WELLS, GEORGE ISLAND.

The town of Spanish Wells is situated on a sandy plain which covers a considerable part of the south side of the island. The growth on this sand flat differs from that on any situation we have mentioned. It may be called the

Lantana-Corchorus Association. It is in such soil that the cocoanut palm particularly flourishes. Here grow *Lantana crocea* Jacq., *Lantana involucrata* L., *Corchorus hirsutus* L., *Baccharis dioica* Vahl., *Solanum havanense* Jacq., *Bumelia loranthifolia* (Pierre) Britton, *Torrubia longifolia* (Heimerl) Britton, *Acacia choriophylla* Benth., *Chrysobalanus icaco* L., *Chrysobalanus fellocarpus* Meyer, and the vines *Jacquemontia jamaicensis* (Jacq.) Hall., and a species of *Clitoria*. The east shore of the island is also sandy, and here were some low dunes covered with a scrubby growth. At places where these dunes were being encroached upon by the sea, the long, deep roots of *Pithecolobium keyense* Britton, *Erithalis fruticosa* L., *Torrubia longifolia* (Heimerl) Britton, *Coccolobis uvifera* (L.) Jacq., and *Jacquinia keyense* Mez were exposed. Other plants of the dunes were *Corchorus hirsutus* L., *Coccothrinax jucunda* Sarg., *Scævola plumieri* Vahl., *Ambrosia hispida* Pursh, *Uniola paniculata* L., and *Suriana maritima* L. These dunes were about 10 feet in height, being the only ones of any consequence seen except those at Governors Harbor, Eleuthera.

A visit of a few hours was made to the mainland of Eleuthera opposite George Island. Here a fine grove of cocoanut palms occupied a sandy inlet on the rocky shore. Among the cocoanuts the undergrowth was principally *Corchorus* with a little *Lantana*, *Euphorbia* (Horse bean), etc. On the rocks behind this sand inlet was a low coppice of *Sideroxylon mastichodendron* Jacq., *Fagara fagara* (L.) Small, *Coccolobis laurifolia* Jacq., *Torrubia longifolia* (Heimerl) Britton, *Amyris elemifera* L., and *Bursera simaruba* (L.) Sarg. Among these a few plants of *Opuntia tuna* Mill. were seen. No poison-wood was found either here or on George Island, while *Byrsonima lucida* (Sw.) DC. (Sweet margaret) and *Duranda plumieri* Jacq. (Wild bittersweet) were not noticed at any place on Eleuthera.

GREGORY TOWN, ELEUTHERA.

At this point the coast is rocky and precipitate on both sides of the island. From shore to shore the distance is about 3 miles, and near the eastern side the country is cut by a number of irregular ridges extending north and south. Landing at Gregory Town on the west side, we went across the island, passing first through pineapple fields on red soil behind the town. These fields were infested with the *Leucæna glauca* (L.) Benth. (Jumby bean), which is often a troublesome weed in such situations. Passing the pineapples, we ascended the slope of a high ridge which was covered

with a low, dense growth of scrubs and trees. The most common species were *Fagara fagara* (L.) Small (Wild lime), *Bourreria havanensis* (L.) Miers (Strong back), *Bumelia microphylla* Griseb. (Ink-berry), *Reynosia septentrionalis* Urban (Darling plum), *Coccolobis laurifolia* Jacq. (Pigeon plum), *Eugenia confusa* DC. (Stopper), *Bursera simaruba* (L.) Sarg. (Gum-elemi), *Acacia choriophylla* Benth. (Cinnecord), *Baccharis dioica* Vahl. (Broom-bush), *Torrubia longifolia* (Heimerl) Britton (Blolly), and *Melochia tomentosa* L. Here we passed for the first time a few plants of the beautiful, yellow-flowered *Catesbæa spinosa* L., which was afterwards found in great abundance at Clarence Harbor, Long Island. The principal vines among this scrubby growth were *Smilax beyrichii* Kunth, *Jacquemontia jamaicensis* (Jacq.) Hall, *Serjania diversifolia* Radlk., and a species of *Passiflora*.

On the flat top of the ridge were found, in addition to most of the plants just mentioned, occasional specimens of *Ichthyomethia piscipula* (L.) Hitch. with its peculiar winged and jointed pods; also *Lantana involucrata* L., *Ficus sapotifolia* Kunth & Benche, *Tecoma bahamensis* Northrop, with almost white flowers, *Erithalis fruticosa* L., *Xylosma ilicifolia* Northrop, and the spiny blue-flowered *Anthacanthus acicularis* Nees., here first seen in bloom.

On the top of the long, gentle slope descending eastward from the summit of this ridge were considerable areas of hard, smooth rock, broken irregularly with deep depressions. Exposed to the full force of the sun and wind and absolutely bare of soil, except in the crevices, these rocks seemed nevertheless a paradise for vines, which covered them to the exclusion of all other growth. Here flourished *Serjania diversifolia* Radlk., *Cissus sicyoides* L., *Parthenocissus quinquefolia* (L.) Planch., *Galactia rudolphioides* (Griseb.) Benth. & Hook., *Rhabdadenia biflora* (Jacq.) Mill., and *Smilax beyrichii* Kunth. In the deep depressions among these vine-clad rocks grew *Bursera simaruba* (L.) Sarg. (Gum-elemi), *Bumelia microphylla* Griseb. (Ink-berry), and *Ficus sapotifolia* Kunth & Benche, while in the smaller crevices were stunted specimens of *Phyllanthus epiphyllanthus* L. (Hardhead) and *Fagara fagara* (L.) Small (Wild lime).

The long eastern slope of the high ridge is broken about half-way down by a second smaller ridge, which rises to about 60 feet above the sea, and slopes gently down to the precipitate cliffs that form the shore. The type of growth that covers this eastern slope presents a different appearance from

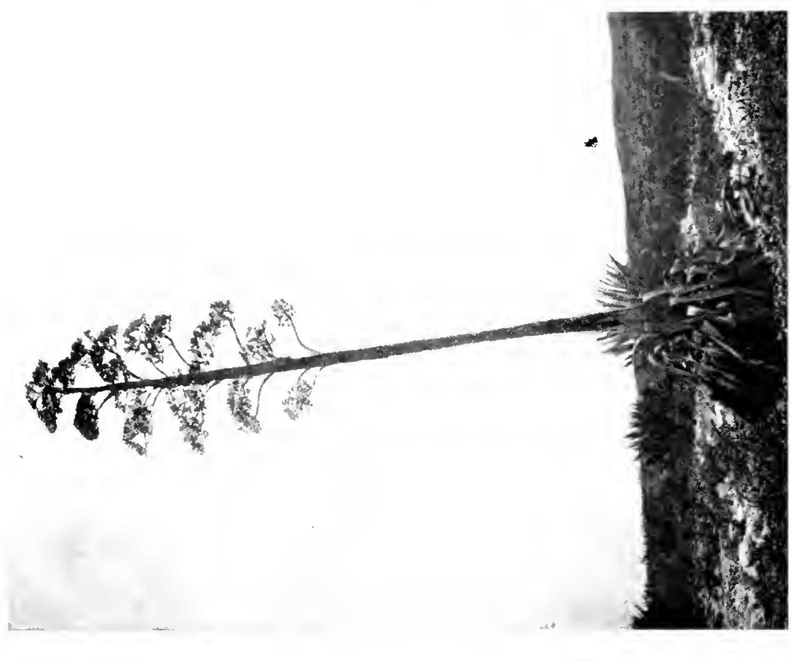


FIG. 1.—"BAMBOO TREE" (AGAVE RIGIDA), GREGORY TOWN, ELEUTHERA

FIG. 2.—EPIPHYTIC PLANT (TILLANDSIA RECURVATA) ON STRUMPFIA MARITIMA IN AN OPEN BRACKISH FLAT, NASSAU

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anything seen on any of the other islands. It is a typical scrub; low, rigid and almost impenetrable. The conditions are extremely xerophytic and the growth in consequence is low and depauperate, rarely reaching a height of over 3 feet. There is no appreciable soil, the hard rock ringing like metal under foot. In spite of all discouragements, the covering was dense, forming an almost unbroken surface. It was composed principally of the following plants: *Baccharis dioica* Vahl. (Broom-bush), *Croton eleuterea* Sw. (Cascarilla), *Coccolobis laurifolia* Jacq. (Pigeon plum), *Phyllanthus epiphyllanthus* (L.) (Hardhead), *Anthacanthus acicularis* Nees., *Lantana crocea* Jacq., *Lantana involucrata* L., *Acacia choriophylla* Benth. (Cinnecord), *Bumelia microphylla* Griseb. (Ink-berry), and *Jacquinia keyensis* Mez (Joe-bush). About 300 yards from the sea, where the ground becomes almost level, the growth is somewhat higher, and a few species not occurring on the hillside find a footing. Among them are *Erithalis fruticosa* L. (Black torch), *Coccolobis laurifolia* Jacq. (small-leaved Pigeon plum), and *Bursera simaruba* (L.) Sarg. (Gum-elemi). Here was beautifully shown the effects of wind action on plant growth. The scrub was about 6 feet high, and formed a dense, canopied roof, open beneath. The trunks were naked and gnarled, often prostrate and rooting at intervals. Rising here and there from among the low growth on the hill slope appeared the great flower-shoots of *Agave rigida* Mill., some reaching a height of 35 feet (Plate XL, Fig. 1). Their appearance only accentuated the barrenness of the scene.

For a distance of about 50 feet from the sharp edges of the rocky shore, the surface is entirely bare of vegetation; then begins to appear a little *Suriana maritima* L. and *Borrichia glabra* Small, which gradually collects itself into a more or less distinct line. Following this is a fringe of *Rhacicallis maritima* (Jacq.) Schum., with *Sesuvium portulacastrum* L. creeping among it. It is peculiar that the *Rhacicallis* here appears behind and not in front of the *Suriana* and *Borrichia*. At one spot near the sea a depression in the rock of about 100 yards in length and 60 feet in breadth had become filled in with sand. The covering here formed a sharp contrast to that of the rocks. It consisted of beautiful areas of *Uniola paniculata* L., broken with dense patches of *Hymenocallis arenicola* Northrop in full flower, with *Euphorbia buxifolia* L. and *Ipomœa pes-capræ* L. creeping on the outskirts. A fine growth of large and small *Inodes palmetto* (Walt.) Cook (Thatch palms) formed a background to the lower growth.

GOVERNORS HARBOR, ELEUTHERA.

Landing in the town on the west side of the island, the first thing of interest observed was a grove of *Casuarina* trees under which were a great number of their seedling plants. These seedlings were most abundant in damp soil on the edge of a small, brackish marsh. They were the only young *Casuarinas* that we saw during the trip. In only two other places had we noticed that *Casuarina* had established itself uncultivated. These were on New Providence, where one or two small trees were seen on the south beach and near the margins of the salt marsh described in the treatment of that island.

Passing over the usual ridge through the center of the island, we found on the eastern beach the best example of dunes that we met with in the Bahamas. These dunes, the highest of which were about 40 feet above the sea, are arranged in a broken series with slight depressions between them. They slope landward to a low meadow of *Cynodon dactylon* (L.) Kuntze (Bermuda grass), which passes easily into the rocky slope of the hills behind. The beach at the foot of the dunes is covered at high-tide mark by an association of *Uniola paniculata* L., *Tournefortia gnaphalodes* (Jacq.) R. Br., *Iva imbricata* Walt., and *Cakile æqualis* L'Her. Behind these is a fringe of tall *Suriana maritima* L. with which is mixed a little *Salmea petrobioides* Griseb. and *Cenchrus tribuloides* L. *Cyperus brunneus* Sw., *Cenchrus* and *Salmea*, together with scattered individuals of *Agave rigida* Mill., cover the seaward slope of the dunes and their outer ridges are occupied by *Uniola paniculata* L., *Cyperus brunneus* Sw., and fine beds of *Hymenocallis arenicola* Northrop. The slight depression between the outer and inner ridges is filled with *Setaria glauca* (L.) Scribn., *Chloris petræa* Desv., *Salmea petrobioides* Griseb., *Agave rigida* Mill., and *Hymenocallis arenicola* Northrop, which is here even more abundant than on the higher places. The tops of the inner ridges are covered with *Chloris petræa* Desv., *Cyperus brunneus* Sw., *Strumpfia maritima* Jacq., *Salmea petrobioides* Griseb., *Euphorbia buxifolia* L., and the trailing *Ambrosia hispida* Pursh. *Urechites andrewsii* (Chapm.) Small, here low, bushy and scarcely trailing, is also rather abundant. The abrupt, landward slope of the dunes is furnished with an open growth of *Setaria glauca* (L.) Scribn., *Cenchrus tribuloides* L., *Leptilon canadense* (L.) Britton, and *Malpighia polytricha* Juss. The latter is here very depauperate, and not over a foot and a half high.

The growth on the western slope of the central elevation is not of the

strongly xerophytic type mentioned above at Gregory Town, but is of the usual low coppice character. Here was growing a little *Metopium metopium* (L.) Small (Poison-wood), the first seen on Eleuthera, and a few specimens of *Bunchosia glandulosa* Rich., a rare plant in the Bahamas; but the most abundant species were *Lantana crocea* Jacq., *Lantana involucrata* L., *Croton lucidus* L., *Fagara fagara* (L.) Small, *Bumelia microphylla* Griseb., *Melochia tomentosa* L., *Erithalis fruticosa* L., and the vines *Croton lucidus* L., *Smilax beyrichii* Kunth, and *Jacquemontia jamaicensis* (Jacq.) Hall. *Helicteres spiralis* Northrop was also found here for the first time since leaving New Providence.

Along the side of the road, at the top of the ridge, was a good deal of a little mint, *Scutellaria longiflora* Small, that has just been described by Dr. Small from south Florida. It, of course, had not before been reported from the Bahamas, and is now known only from south Florida and from this point.

TARPUM BAY, ELEUTHERA.

Extending back from the town for several miles is a flat, rocky plain, which is bounded on the west by a range of hills. This plain was extremely dry at the time we were there, but the vegetation showed little signs of suffering from lack of water. We found here a number of plants not before seen, among them being *Cardiospermum helicacabium* L., *Teucrium cubense* L., and *Cassia aspera* Mich. The principal trees and scrubs that formed the rather low coppice of the flat plain were *Eugenia confusa* DC., *Acacia choriophylla* Benth., *Croton lucidus* L., *Fagara fagara* (L.) Small, *Lantana involucrata* L., *Pithecolobium keyense* Britton, *Tecoma bahamense* Northrop, *Corchorus hirsutus* L., *Torrubia cokeri* Britton, *Coccolobis laurifolia* Jacq., *Bourreria havanensis* (L.) Miers, and *Phyllanthus epiphyllanthus* L. The following were less abundant: *Bursera simaruba* (L.) Sarg., *Ichthyomethia piscipula* (L.) Hitch., *Metopium metopium* (L.) Small, and the plants mentioned above as here first collected. The principal vines were *Jacquemontia jamaicensis* (Jacq.) Hall, *Parthenocissus quinquefolia* (L.) Planch., and a species of *Sorjania*. *Bryophyllum pinnatum* (Lam.) S. Kurz (Live-forever) was very abundant and from its fallen leaves were growing a number of young plants.

The banana-holes that occurred here and there in the rocky plain showed a type of vegetation in every respect different from the ordinary level. The contrast was about as marked as if a tub of waterlilies were set among a bed

of *Agaves*. In one such banana-hole, about 30 feet across, grew *Anona palustris* L. (Custard-apple), *Ficus sapotifolia* Kunth & Benche, *Picramnia pentandra* Sw. (Snake root), here 15 feet in height *Psychotria undata* Jacq. and *Cladium effusum* Torr. Attached to the sides of the depression, beneath its overhanging edges, flourished *Adiantum melanolucum* Willd., *Odontosoria clavata* Sw., and other ferns.

POWELLS POINT, ELEUTHERA.

The beach at this point is sandy, with rocks projecting at intervals. Behind the beach is a slightly elevated, sandy plain, which extends for about 100 yards and is then interrupted by an extensive mangrove marsh. At one end of this marsh, where the water is shallow, there was a dense, almost pure growth of *Eleocharis cellulosa* Torr., which occupies an area of about 100 by 50 yards and is unbroken except for occasional clumps of mangrove. This was the first time we had noticed this sedge, but it was found again in a similar situation at Arthurs Town, Cat Island. On the hills behind the swamp mahogany and mastic were conspicuous.

In the sandy plain, above mentioned, grew a number of small specimens of the *Cyclospathe northropi* Cook (Hog-cabbage palm), here first seen. Along the shore, just behind the usual beach plants, was a dense thicket, the outer face of which was sheared by the wind into a slope leading from the ground to a height of about 6 feet. The most noticeable peculiarity of this coppice was the grouping of its different plants into almost pure association, which followed each other not from without inward, but along the beach. A pure growth of *Reynosia septentrionalis* Urban (Darling plum) would be succeeded by an equally pure growth of *Pithecolobium keyense* Britton (Ram's horn); this by *Acacia choriophylla* Benth. (Cinnecord), and this by *Eugenia buxifolia* (Sw.) Willd. The area occupied by each was sometimes as much as 20 feet. This was the only place in the Bahama Islands where we found coppice plants of a single species forming clumps of any extent uninterrupted by other forms. In fact, the mixed character of tropical vegetation and the almost entire absence of extensive bodies of single species, is one of the most striking and remarkable differences that it presents to our temperate growth. The conspicuousness of this characteristic is well shown by the giving of the name "Family Wood" to *Coccolobis krugii* Lindau in Watlings Island because it occasionally forms small areas without admixture with other plants. As one passes through a typical Bahama coppice, different plants are met with at every

step. The variety seems interminable and on first acquaintance one is appalled with the difficulty of becoming acquainted with them.

ARTHURS TOWN, CAT ISLAND.

The general configuration of the land is similar to that at Tarpum Bay, and a wide, flat plain stretches inward from the western side. About 1 mile from the shore there are a series of small fresh-water pools, where we found many things to interest us. *Utricularia* was here first seen on the Islands, as was also the beautiful waterlily, *Castalia ampla* (DC.) Green, not before reported from the Bahamas, which dotted the water with pure white flowers. Along the edges of the pools grew the two attractive little plants *Spigelia anthelmia* L. and *Sabbatia campanulata* (L.) Britton, with *Centella repanda* (Pers.) Small, a species of *Polygonum*, and several of the *Onograceæ*. None of these plants is often met with in the Bahamas, as they indicate fresh water, and fresh water is exceedingly hard to find in these Islands. *Myrica cerifera* L. and *Inodes palmetto* (Walt.) Cook (Thatch palm), which are also fond of fresh water, were not uncommon here.

The rocky plain was covered with about the same sort of growth as that described from Tarpum Bay. Here we saw the scrub *Bonamia cubana* A. Rich., a remarkable member of the *Euphorbiaceæ*, not before reported out of Cuba. A large specimen of *Ficus brevifolia* Nutt., 40 feet in height, was passed near the town: from its trunk and branches hung great quantities of small and matted aerial roots.

In a long, brackish marsh a few hundred feet behind the beach was a fine association of *Typha domingensis* Pers. and the sedge *Eleocharis cellulosa* Torr. mentioned from Powells Point. Except at this place, *Typha* was seen only on New Providence, where it is abundant at Lake Killarney.

Epiphytes were rather common in the coppice cover of the rocky plain. *Tillandsia utriculata* L. with flower stalks about three feet high was most conspicuous. One thatch palm was particularly attractive with its covering of ferns and yellow orchids.

PORT NELSON, RUM CAY.

The town is situated on a sandy level which passing westward into a low, damp flat, finally sinks into a mangrove marsh. Near the shore were vigorous specimens of *Mimusops sieberi* A. DC. (Wild sapodilla), 20 feet high, the largest that we met with. Here also grew a number of mahogany trees, 25 feet

in height. The sandy plain just mentioned is covered with *Chloris barbata* Nash., *Setaria glauca* (L.) Scribn., *Ipomœa pes-capræ* Sw., *Canavalia obtusifolia* (Lam.) DC., *Cassia bahamensis* Mill., *Baccharis dioica* Vahl., *Torrubia longifolia* (Heimerl) Britton, *Pluchea odorata* (L.) Cass., *Bumelia loranthifolia* (Pierre) Britton (here called Wild resin), *Melochia tomentosa* L., and *Bourreria havanensis* (L.) Miers; with the vines *Rhabdadenia biflora* (Jacq.) Mill. and *Urechites andrewsii* (Chapm.) Small. *Colubrina colubrina* (L.) Small (Wild coffee), not before seen except on Green Cay, was also rather abundant. It formed a spreading tree, about 12 feet high, that gave a dense shade. Here also we first met with the *Opuntia triacantha* DC. (Dildo cactus), with small purple flowers and very sharp spines. *Opuntia tuna* Mill., with yellow flowers, was also scattered about. These *Opuntias* and the *Colubrina* extended to the top of the ridge which ran along southern-eastern shore. On the top of this ridge, among the hard, smooth rocks, we found *Gossypium barbadense* L. (Cotton) growing wild. Its bolls had opened and the white lint was produced in abundance. Here on top and down the eastern slope grew *Agave rigida* Mill., *Plumiera obtusa* L., *Metopium metopium* (L.) Small (Poisonwood), and *Guaiacum sanctum* L. (Lignum vitæ), all of low, stunted habit. Here we first found *Guettardia scabra* Vent. In addition to these there were, of course, the plants more ordinarily found in such situations, such as *Bumelia loranthifolia* (Pierre) Britton (Milk plum), *Reynosia septentrionalis* Urban (Darling plum), and *Bumelia microphylla* Griseb. (Ink-berry). This ridge extends in a semicircle, enclosing to the eastward a flat plain that seemed to have been cultivated in part. The vegetation of the enclosed plain was of a distinctly different type from that on the ridge. There was little shrubbery, but weeds and grasses were abundant. *Bidens leucantha* Willd., *Abena jamaicensis* (L.) Hitch., *Leptilon canadense* (L.) Britton, *Phyllanthus niruri* L., *Turnera ulmifolia* L., *Chloris petræa* Desv., *Cenchrus tribuloides* L., *Evolvulus arbusculus* Poir., *Sida carpinifolia* L., and *Salmea petrobioides* Griseb. were all abundant. The principal scrubs were *Lantana crocea* Jacq., *Lantana involucrata* L., *Cassia bahamensis* Mill., *Melochia tomentosa* L., *Baccharis dioica* Vahl., *Corchorus hirsutus* L., and *Pithecolobium keyense* Britton.

Behind the hills on the northeast side of the cay is a large salt-water pond whose immediate margins are clothed with a dense jungle of *Rhizophora mangle* L., which varies from a few feet to many feet in width. Behind this is a slightly less dense association of *Conocarpus*, *Laguncularia* and *Avicennia*. Growing among them we found, to our amazement, the *Calonyction bona-nox*

FIG. 1.—PIGEON PLUM TREE (COCCOLOBIS LAURIFOLIA), CLARENCE HARBOR, LONG ISLAND

FIG. 2.—MANGROVE TREES (RHIZOPHORA MANGLE), GREAT LAKE, WATLINGS ISLAND

VIEWS ILLUSTRATING VEGETATION

(L.) Small (Moon flower) of our gardens. Within this association are open places of various sizes where the ground is composed of soft, white mud that is so extremely salt and barren as to be in some places entirely devoid of vegetation. *Avicennia*, low and depauperate, extends farthest into these mud flats. The individual plants are widely scattered, but their aerial roots project thickly out of the ground. Among them, but extending not quite so far in, grows the grass *Sporobolus virginicus* Kunth, which next to the *Avicennia* is probably the most salt-resisting plant in the Bahamas. *Salicornia ambigua* Michx. is in many places mixed with the grass, or either may occur in pure association. *Sesuvium portulacastrum* L. is often found among the *Salicornia*, or just behind it. This flat marsh rises very gradually towards the west and as conditions become a little less hard, *Baccharis dioica* Vahl. makes its appearance and soon gets to be abundant. Next appears the *Dodonæa viscosa* L. (Candlewood), with its winged pods; then *Pithecolobium keyense* Britton (Ram's horn), *Torrubia longifolia* (Heimerl) Britton (Blolly), and *Reynosia septentrionalis* Urban (Darling plum). About the point where the latter appear, the flat plain that we have previously described begins.

Fine specimens of the hog-cabbage palm are said to grow on the northern edge of the island, but as we were ashore but a few hours we had no time to look for it.

WATLINGS ISLAND.

Beginning with the beach, we shall describe the vegetation met with as one passes directly eastward from Cockburn Town across the island until the second large lake about 6 miles inward is reached. Further than this we did not go. For the sake of convenience the plants will be described under the different formations and associations that were included in this range.

Beginning then with the beach on the western side, we have first:

The Sand-strand Formation.—This may be divided here into four plant associations, as follows:

1. *Tournefortia-Suriana Association.*—This occupies the rocky or sandy ledge that runs along the beach at high-tide mark. The rock here is not hard, but soft and generally covered with sand. The association is but a few feet wide and, beside *Tournefortia* and *Suriana*, contains scarcely any other plants, except a little trailing *Ambrosia hispida* Pursh. Behind this ledge there is a sandy flat of about 20 feet in width which is covered by the following:

2. *Distichlis-Ambrosia Association.*—The two plants, *Distichlis maritima*

Raf. and *Ambrosia hispida* Pursh, form almost the entire covering of this area. There is very little shrubbery, but in some places the peculiar beach form of *Erithalis fruticosa* L. (Black torch) spreads its procumbent branches on the ground.

3. *The Cocoa-plum Association.*—This occupies the rounded sandy elevation immediately behind the flat area of the above. It is about 25 feet wide and is composed almost entirely of the two species of *Chrysobalanus fellocarpus* Meyer (Cocoa plum) and *Chrysobalanus icaco* L., which for long distances may be entirely pure. Scattered individuals of *Coccolobis uvifera* (L.) Jacq., *Ilex krugiana* Loes., *Ernodea littoralis* Sw., *Genipa clusiæfolia* (Jacq.) Griseb., *Metopium metopium* (L.) Small (Poison-wood), *Reynosia septentrionalis* Urban (Darling plum), and *Eugenia confusa* DC. (Stopper) appear in this association, but they do not form a conspicuous part of the covering. On the landward slope of this elevation the next association appears.

4. *Inodes-Lantana Association.*—The *Inodes palmetto* (Walt.) Cook (Thatch palms) here form a very distinct line that may be seen in Plate XLIII, Fig. 1. They are 20 to 25 feet high, and extend somewhat into the next formation. Among them grow *Lantanas*, *Phyllanthus epiphyllanthus* L., *Chloris petræa* Desv., *Cenchrus tribuloides* L., and a little of the half-prostrate *Dalbergia ecastrophyllum* (L.) Taub.

Fresh-marsh Formation.—At the foot of the sand slope there is a long, narrow fresh marsh, generally not over 20 or 30 feet in width. In places there is standing water, but often the soil is merely damp. The palms extend into this formation only in dry places, and not abundantly. In the deeper pools grows *Typha domingensis* Pers., while in shallower water and on the wet margins are dense, pure associations of *Eleocharis cellulosa* Torr. The delicate little trailing *Monniera monniera* (L.) Britton also occurs around the water, where it is often mixed with *Lithophila vermicularis* (L.) Uline. Scattered here and there in this formation was a tall grass 8 or 10 feet high, which, not being in flower, we have not been able to identify. At one place in the marsh to the north of the town we found a black-fruited *Chrysobalanus fellocarpus* Meyer (Cocoa plum), 25 feet high and 14 inches in diameter—a size most unusual for this species.

Conocarpus-flat Formation.—This extends backward from the marsh for several hundred yards. The ground is of honeycomb rock with water in the depressions, and is covered with an almost pure association of *Conocarpus erecta sericea* Fors. This wet area slowly rises into a long, gentle slope, which

culminates about three-quarters of a mile from the town and then gently slopes again to another Conocarpus-flat behind the western lake.

LOW-COPPICE FORMATION.—This covers the elevation just mentioned, which follows the Conocarpus-flat. The growth, which is not often more than 8 or 10 feet high, is composed principally of the following species: *Croton lucidus* L., *Amyris elemifera* L. (White torch), *Calliandra hæmatomma* Benth., *Erithalis fruticosa* L. (Black torch), *Bourreria havanensis* (L.) Miers (Strong-back), *Coccolobis laurifolia* Jacq. (Pigeon plum), *Rapania guyanensis* Aubl. (Beef-wood), *Reynosia septentrionalis* Urban (Darling plum), *Bumelia microphylla* Griseb. (Ink-berry), *Mimusops sieberi* A. DC. (Wild sapodilla), *Metopium metopium* (L.) Small (Poison-wood), *Chytraculia pallens* (Griseb.) Britton (Spice-wood), *Coccolobis krugii* Lindau (Family-wood), *Philanthus myrtilloides* Griseb. (Boar black torch), *Exostemma caribæum* (Jacq.) R. & S. (Prince-wood), *Buxus bahamensis* Baker (Crispy-wood), *Eugenia confusa* DC. (Stopper), *Ilex krugiana* Loes, *Eugenia buxifolia* (Sw.) Willd. (White head), *Maytenus buxifolia* (Rich.) Griseb., *Byrsonima lucida* (Sw.) DC. (Sweet margaret), and *Gymnanthes lucida* Sw. This formation passes eastward into the low, rocky marsh described below.

CONOCARPUS-MANGROVE FORMATION.—Here the growth is not dense and is generally about 8 feet high. Except near the lake shore, the growth is pure *Conocarpus*, but on the water's edge is a dense fringe of *Rhizophora mangle* L. At certain places behind this mangrove, *Avicennia nitida* Jacq. reaches a size not approached at any other point visited. It is 50 feet high and 2 feet in diameter at base. Beneath these trees the soil is a soft, black mud, through which innumerable aerial roots protrude. On sandy margins of the lake we found for the first time the *Hippomane mancinella* L. (Manchineel) of evil repute. Here also was *Batis maritima* L., a low, succulent plant growing in scattered clumps, and *Lithophylla vermicularis* (L.) Uline.

The water of the lake was very clear and in most places not over 4 or 5 feet deep. *Acetabularia* grew in the greatest abundance on its rocky floor, and *Ruppia maritima* L. was also plentiful. The water here is as salt as that of the sea, with which it no doubt has underground connection, as it rises and falls with the tides.

HIGH-COPPICE FORMATION.—This small lake connects by a narrow channel with a larger lake east of it from which it is separated at most places by a sharp ridge. On this elevation was a coppice growth of larger size than any so far described for the island. Here grow fine spreading specimens of

Guaiacum sanctum L. (Lignum vitæ), 18 feet high; also a species of fig, *Metopium metopium* (L.) Small (Poison-wood), *Gymnanthes lucida* Sw. (Crab-wood), *Bourreria havanensis* (L.) Miers (Strong-back), *Coccolobis laurifolia* Jacq. (Pigeon plum), *Ichthyomethia piscipula* (L.) Hitch. (Dog-wood), *Bursera simaruba* (L.) Sarg. (Gum-elemi), *Acacia choriophylla* Benth., *Tecoma bahamensis* Northrop, *Thouinia discolor* Griseb., *Citharexylum quadrangulare* Jacq., *Chiococca parvifolia* Willd., *Bumelia microphylla* Griseb. (Ink-berry), *Lantanas, Cajanus cajan* (L.) Millsp., with the vines *Smilax beyrichii* Kunth, and *Serjania subdentata* (Juss.) Poir. Here also grew *Thrinax bahamensis* Cook (Goat palm) in more or less abundance. On a small cay in the large central lake was a magnificent grove of *Rhizophora mangle* L., which reached a height of 30 feet. In its branches the black cormorants were building in great number.

The large central lake is bounded on the west by another high and broader ridge. Its covering is very much like that of the other ridge just described. The columnar *Pilocereus lanuginosa* Rumpl. occurred here, as did also *Opuntia tuna* Mill. From the western base of this ridge there extends another rocky Conocarpus-flat like that already described, which is bounded eastward by a third salt lake. In the Conocarpus-flat, near the lake, was growing a good deal of *Vanilla articulata* Northrop, climbing up into the *Conocarpus.* On the sandy shore grew manchineel again, with the goat palm and *Conocarpus.*

About one-half mile north of Cockburn Town there are along the beach some low sand dunes where *Coccothrinax jucunda* Sarg. (Silver palm) is abundant. The gentle, landward slope of these dunes supports a low, scrubby growth of such typical sand-growing plants as *Solanum bahamense* L., *Turnera ulmifolia* L. (here called "Buttercup"), *Pluchea fœtida* (L.) B. S. P., *Baccharis dioica* Vahl., *Petitia pœppigii* Schan., *Ernodea littoralis* Sw., *Genipa clusiifolia* (Jacq.) Griseb., *Phyllanthus epiphyllanthus* L. (Hard-head), *Pithecolobium keyense* Britton (Ram's horn), *Cassia* species, *Eugenia confusa* DC. (Stopper), with the vines *Rhabdadenia biflora* (Jacq.) Mill., *Urechites andrewsii* (Chapm.) Small, *Smilax beyrichii* Kunth, *Jacquemontia jamaicensis* (Jacq.) Hall, species of *Passiflora*, and the trailing, parasitic *Cassytha*. *Chloris petræa* Desv., *Setaria glauca* (L.) Scribn., and *Cenchrus tribuloides* L. were the principal grasses here. As this slope approaches the fresh-water marsh, there appeared distinct associations, almost pure, in series as follows: (1) *Pluchea odorata* (L.) Cass.; (2) *Lippia* species; (3) *Cladium effusum*

Torr.; (4) *Inodes palmetto* (Walt.) Cook; then comes the narrow fresh-water marsh, followed by the Conocarpus-flats already described. A little further north from this point the fringe of *Cladium effusum* Torr. widens out into a beautiful flat about one-half mile wide, where the *Cladium* grows thickly and in pure association.

CLARENCE HARBOR, LONG ISLAND.

At this point we found much to interest us. Two ranges of hills begin here and extend northwestward, one about a mile from the north shore, the other close to the south shore. Between them is a rocky plain about 2 miles wide which, behind the town, extends uninterruptedly across the island. On this plain the conditions are extremely xerophytic, but most so in the part lying nearest the settlement. Here were growing considerable thickets of *Fagara fagara* (L.) Small (Wild lime) and *Catesbæa spinosa* L., reminding one in their appearance of the thickets of Chickasaw plum, common around settlements in the southern United States. The *Catesbæa* was here seen for the second time. It was heavily loaded with fruit and showed but few flowers. Other abundant plants in this area were *Bumelia microphylla* Griseb., *Croton linearis* Jacq., *Cordia bahamensis* Urban, *Cordia globosa* (L.) H. B. K. (here first met with), *Melochia tomentosa* L., *Cordia cylindrostachya* R. & P., *Bourreria havanensis* (L.) Miers, *Torrubia longifolia* (Heimerl) Britton, with the smaller herbaceous plants, *Heliotropium parviflorum* L., *Sida carpinifolia* L., *Bidens leucantha* Willd., and *Chloris barbata* Nash. On the north slope of the line of hills nearest the town, the conditions are also extremely xerophytic. Here was a low growth resembling somewhat that found at Gregory Town, Eleuthera, but not so regular and low. The constituents of this scrub were, however, not the same as at Gregory Town. The most abundant plants were *Lantana involucrata* L., *Erithalis fruticosa* L., *Pithecolobium keyense* Britton, *Cajanus cajan* (L.) Millsp., *Tecoma bahamensis* Northrop, *Psychotria undata* Jacq. (here a low scrub 2 feet and 6 inches high), *Reynosia septentrionalis* Urban, *Eugenia confusa* DC., *Eugenia buxifolia* (Sw.) Willd., *Tetrazygia bicolor* (Mill.) Cogn., *Croton longifolia*, *Phyllanthus epiphyllanthus* L., with the vines *Smilax beyrichii* Kunth, *Jacquemontia jamaicensis* (Jacq.) Hall, and *Stigmatophyllon sagræanum* Juss. Growing on the ground, on this hillside, we found the rare fungus, *Diplocystis wrightii* B. & C., a member of the *Lycoperdineæ*. Near the top of the hill were fine specimens of *Pilocereus lanuginosa* Rumpl., mentioned above from Current Town, Eleuthera, and Watlings Island.

Passing northward from the town along the coast and then turning to the left and ascending the hill, we came to an old field covered with an extremely dense growth of *Leucæna glauca* (L.) Benth. (Jumby bean) and *Cajanus cajan* (L.) Millsp. (Stinking pea) in almost pure association. The tops of the plants, which were about 7 feet and 6 inches high, formed an almost level floor. On the top of the ridge beyond this field there is a rather high coppice composed largely of different species from those so far mentioned from this point. The most abundant constituents of the higher growth were *Lysiloma bahamensis* Benth. (Wild tamarind), *Rapania guyanensis* Aubl. (Beef-wood), *Guaiacum sanctum* L. (Lignum vitæ), *Krugiodendron ferreum* (Vahl.) Urban (Iron-wood), *Erythroxylon brevipes* DC. (Sareto), *Tetrazygia bicolor* (Mill.) Cogn. (Wild guava), *Tecoma bahamensis* Northrop, *Cæsalpinia vesicaria* L. (Braziletto), *Fagara flava* (Vahl.) Kr. & Urb. (Yellow-wood), *Reynosia septentrionalis* Urban, *Amyris elemifera* L. (White torch), *Gymnanthes lucida* Sw. (Crab-wood), *Maytenus buxifolia* (Rich.) Griseb. (Spoon-wood), *Hypelate trifoliata* Sw. (Red-wood), *Exostemma caribæum* (Jacq.) R. & S. (Prince-wood), *Torrubia longifolia* (Heimerl) Britton (Blolly), and *Bursera simaruba* (L.) Sarg. (Gum-elemi). The height of these trees is about 15 to 20 feet. In nearly all cases the bark of the trunks was white from crustaceous lichens. In fact, it was hard to find a square inch of bark that was not covered with these lichens. The trunk of the gum-elemi is an exception. Its habit of defoliating its bark in thin, papery sheets prevents the lichens from securing a foothold. As a consequence, its red trunks show in sharp contrast among the white ones of its neighbors. The wild guava is peculiar in having white bark that is natural and not due to a covering of lichens. This is true also, by the way, of *Jacquinia keyensis* Mez (Joe-bush), and to a less extent of *Coccolobis laurifolia* Jacq. (Pigeon plum). The undergrowth of the above coppice consists principally of *Fagara fagara* (L.) Small (Wild lime), *Catesbeæ spinosa* L., *Fagara coriacea* (A. Rich.) Kr. & Urb. (Doctor's club), *Bumelia microphylla* Griseb., *Bunchosia glendulosa* Rich., *Erithalis fruticosa* L. (Black torch), *Chiococca parvifolia* Wullschl., *Cordia bahamensis* Urban, *Phyllanthus epiphyllanthus* L. (Hard-head), and *Croton longifolia*. The vines *Triopteris rigida* Sw., *Smilax beyrichii* Kunth, and *Jacquemontia jamaicensis* (Jacq.) Hall were also abundant.

It will be observed that the growth in this coppice differs from any that have been before described. It possesses, on the one hand, the character of the low xerophytic condition, and on the other, the peculiarities of what we

FIG. 1.—VEGETATION ON ROCKY COAST, NEW PROVIDENCE

FIG. 2.—VEGETATION ON SANDY SHORE, NEW PROVIDENCE

VIEWS ILLUSTRATING VEGETATION

have called the high coppice where moisture is more plentiful. It may perhaps be explained from the dry conditions being here modified by an unusually productive soil, for the soil is of red loam, which is the most fertile on the Islands.

On the opposite side of the island from the town we found several hog-cabbage palms growing in a thick coppice of *Reynosia septentrionalis* Urban (Darling plum). This was the third time we had seen the hog-cabbage palm, and nowhere was it large.

WHICH POINT, ABACO.

The shore at this point was rocky and sandy. In addition to the usual beach plants, such as *Suriana maritima* L., *Salmea petrobioides* Griseb., *Tournefortia gnaphalodes* (Jacq.) R. Br., *Uniola paniculata* L., *Iva imbricata* Walt., *Distichlis maritima* Raf., *Cenchrus tribuloides* L., *Ambrosia hispida* Pursh, *Hymenocallis arenicola* Northrop, and *Ipomœa pes-capræ* L., etc., we found here for the second time the new *Euphorbia* with whitish leaves (*Euphorbia cayensis* Millsp.), first collected from Rum Cay. On the low, narrow sand ridge just back of the beach grew an abundance of *Dodonæa viscosa* L., mentioned above from Rum Cay, and a little *Ichthyomethia piscipula* (L.) Hitch. (Dog-wood), neither of which had before been seen in such a situation. In addition to these, the principal plants of this elevation were *Cassia choriophylla* (Cinnecord), *Ernodea littoralis* Sw., *Bourreria havanensis* (L.) Miers (Strong-back), *Jacquinia keyensis* Mez (Joe-wood), *Erithalis fruticosa* L. (Black torch), *Bumelia loranthifolia* (Pierre) Britton (Milk plum), *Genipa clusiæfolia* (Jacq.) Griseb., *Tetrazygia bicolor* (Mill.) Cogn., *Torrubia longifolia* (Heimerl) Britton, *Swietenia mahogani* L. (Mahogany), *Fagara coriacea* (Yellow-wood), and *Cassytha filiformis* L. *Juniperus barbadensis* L. (Cedar) was not seen here, but occurred sparingly farther inland. Behind the beach was a Conocarpus-flat of the usual character, and this was followed by the extensive pine-barrens, which occupy a large part of the island. The ground in these barrens was covered with a dense, tangled growth of *Pteridium caudatum* (L.) Kuhn (Maypole fern) from 4 to 6 feet high. This growth we found more difficult to penetrate than any we had met with. Our progress could hardly be called walking, and it took us about an hour to pass a half mile into it. This extraordinarily dense growth of fern was no doubt partly to be accounted for by the repeated burnings to which the forest had been subjected in order to facilitate the hunting of wild hogs. Plate XXXVII, Fig. 2,

gives an idea of the conditions here. Among the pines the following scrubs or trees were observed: *Tetrazygia bicolor* (Mill.) Cogn. (Wild guava), *Cordia bahamensis* Urban, *Ichthyomethia piscipula* (L.) Hitch. (Dogwood), *Bursera simaruba* (L.) Sarg. (Gum-elemi), *Metopium metopium* (L.) Small (Poison-wood), *Swietenia mahogani* L. (Mahogany), *Tecoma bahamensis* Northrop, *Bumelia microphylla* Griseb. (Ink-berry), *Acacia choriophylla* Benth. (Cinne-cord), *Anthacanthus acicularis* Nees., *Duranta repens* L. (Bitter-sweet), *Ernodea littoralis* Sw., *Myrica cerifera* L., *Willughbaya heterophylla* Small, *Rajania hastata* Kunth, *Byrsonima lucida* (Sw.) DC. (Sweet margaret), *Erythroxylon brevipes* DC. (Sareto), *Morinda roioc* L., *Hypelate trifoliata* Sw. (Red-wood), *Bourreria havanensis* (L.) Miers. (Strong-back), *Exothea paniculata* (Juss.) Radlk. (Butter-bough), *Vernonia bahamensis* Griseb., *Gymnanthes lucida* Sw. (Crab-wood), *Eugenia buxifolia* (Sw.) Willd., *Erithalis fruticosa* L. (Black torch), *Rapania guyanensis* Aubl. (Beef-wood), and *Coccolobis laurifolia* Jacq. (Pigeon plum). Beneath the ferns was found the new species of *Ernodea* (*Ernodea cokeri* Britton), with much more delicate leaves than the common *Ernodea littoralis* Sw. Here also was found *Galium hispidulum* Mich., first collected from the Bahama Islands.

At certain places the Conocarpus-flat was bordered with an association of *Aster tenuifolius* L. and *Distichlis maritima* Raf., mixed in places with a little *Salicornia ambigua* Michx., resembling, with the exception of the *Salicornia*, the association already mentioned on the border of a brackish pond in New Providence. In the coppice behind this association grew *Swietenia mahogani* L. (Mahogany), *Bumelia loranthifolia* (Pierre) Britton (Milk plum), and a little, scattered *Juniperus barbadensis* L. The milk plum was here the highest seen, reaching 12 feet, with a diameter of 9 inches. *Epidendrum fucatum* Lindl. (Yellow orchid) and *Phorodendron spathulifolium* Kr. & Urb. were abundant on the trees, the mistletoe showing its usual preference for mahogany.

LIST OF PLANTS COLLECTED.

* Names preceded by an asterisk indicate that the species was collected for the first time in the Bahamas by the Botanical corps of the Bahama Expedition.

MYXOMYCETES.[13]

**Physarum compressum* A. & S. Dr. Farlow says: "This specimen is interesting as being a form of the species noted in the tropics by Lister, but although not quite the northern form, still not specifically distinct."

**Physarum globuliferum* (Bull.) Pers.

[13] Determined by Dr. W. G. Farlow. All collected at Mangrove Cay, Andros.

**Physarum viride* Pers.

**Didymium squamulosum* (A. & S.) Fr. (*D. effusum* Link).

**Dictydium cancellatum* (Batsch.) Macbride (*D. umbilicatum* Schrad.). A widely distributed species.

**Arcyria punicea* Pers.

**Arcyria œrstedtii* Rostf. (?). Dr. Farlow remarks of the above that "it answers to descriptions of *Arcyria œrstedtii* Rostf. in most respects, but the capillitium is not the same as in specimens of that species. It may be new."

**Arcyria cinerea* (Ball.) Pers. (*A. albida* Pers.).

**Hemitrichia clavata* (Pers.) Rostf.

**Lycogola epidendron* (L.) Fr.

**Stemonitis herbatica*. Dr. Farlow says of this: "It resembles in some respects *S. herbatica* Peck. and also *S. smithei* Macbr., but as far as can be told from the specimens, the spores have not the ferruginous color of the latter species."

ALGÆ.†

SCHIZOPHYCEÆ.[14]

Gleocapsa sp. On damp rocks, Mt. Vernon, Nassau.

Nostoc commune Vauch. On bare rocks, Mt. Vernon, Nassau. Cosmopolitan.

Scytonema sp. Lichenised. On bare rocks, Mt. Vernon, Nassau.

Calothrix æruginea Bornet. On floating Sargassum, Atlantic Ocean off South Carolina. Cosmopolitan.

Lyngbya majuscula (Dillw.) Harv. Eleuthera opposite Current Settlement. Cosmopolitan. Determined by Dr. M. A. Howe.

CONJUGATÆ.

Spirogyra rivularis var. *minor* Hansg. In a rock hole, Killarney barrens, New Providence; Europe. Determined by Mr. F. S. Collins.

CONFERVALES.

Trentepolia aurea (L.) Mart. On trees and rocks, Soldiers road, Nassau. Determined by Dr. M. A. Howe.

Rhizoclonium riparium var. *implexum* (Dillw.) Rosenw. In a brackish pool, Mt. Vernon, Nassau. Exposed at low tide. Cosmopolitan. Determined by Mr. F. S. Collins.

SIPHONEÆ.[15]

Bryopsis plumosa (Huds.) Ag. Rocks, west shore of Eleuthera, opposite Current Settlement.

Caulerpa racemosa uvifera (Turn.) J. Ag. West shore of Eleuthera, Current Settlement.

Caulerpa cupressoides ericifolia (Turn.) Web.-v. Bosse. Little Mangrove Cay, Andros.

Caulerpa paspaloides (Bory) Grev. Green Cay. Dredged in 4 fathoms.

**Caulerpa compressa* (Web.-v. Bosse) Howe. Clarence Harbor, Long Island. In 4 feet of water. This species has been described from our material by Dr. M. A. Howe in Bull. Torr. Bot. Club, Vol. XXXI, 1904, pp. 93-94.

Aurainvillia longicaulis (Kuetz.) Marr. & Bood.

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[14] Determined, except the last, by Mr. F. S. Collins.

[15] Determined by Dr. M. A. Howe.

† It is not known exactly how many Algæ are new to the Bahamas.

Aurainvillia nigricans Dcne. West shore of Eleuthera, opposite Current Settlement.

Penicillus capitatus Lamarck var. The typical form has a longer stalk and rounder head. Mangrove Cay, Andros.

**Rhipocephalus phœnix* (Ell. & Soland.) Kuetz. Mangrove Cay, Andros. This species has been discussed by Dr. M. A. Howe in Bull. Torr. Bot. Club, Vol. XXXI, 1904, p. 94.

Udotea conglutinata (Ell. & Soland.) Lamour. Mangrove Cay, Andros; Green Cay. Dredged in 4 fathoms.

Halimeda tridens (Ell. & Soland.) Lamour. Mangrove Cay, Andros; Green Cay. Dredged in 4 fathoms.

Halimeda tuna (Ell. & Soland.) Lamour. West shore of Eleuthera, opposite Current Settlement.

Codium tomentosum (Huds.) Stackh. West shore of Eleuthera, Current Settlement.

Valonia utricularis Ag. West shore of Eleuthera, Current Settlement.

Valonia ventricosa J. Ag. On rocks, Eleuthera, opposite Current Settlement.

Siphonocladus membranaceus (Ag.) De Ton. var. Mangrove Cay, Andros.

Chamædoris peniculum (Ell. & Soland.) Kuntze. Gregory Town, Eleuthera.

Dictyosphæria favulosa (Ag.) Decne. Mangrove Cay, Andros; Green Cay. Dredged in 4 fathoms.

Microdictyon crassum J. Ag. Green Cay. In 4 fathoms of water. This species has been discussed by Dr. M. A. Howe in Bull. Torr. Bot. Club, Vol. XXXI, 1904, p. 94.

Anadyomene stellata (Wulf.) Ag. Mangrove Cay, Andros.

Acetabulum crenulatum (Lamour.) Kuntze. Green Cay; dredged in 4 fathoms.

Coccocladus occidentalis (Harv.) Cramer. Mangrove Cay, Andros; Green Cay. Dredged in 4 fathoms.

**Coccocladus occidentalis laxus* Howe. Big Pond, Nassau. In small sink-holes. This variety was described by Dr. M. A. Howe in Bull. Torr. Bot. Club, Vol. XXXI, 1904, p. 95, pl. 6.

**Neomeris cokeri* Howe. Opposite Current Settlement, Eleuthera. This species was described from our material by Dr. M. A. Howe in Bull. Torr. Bot. Club, Vol. XXXI, 1904, p. 97, pl. 6.

CHARACEÆ. †

Chara foliolosa zeylanica Klein. Fresh marsh, Arthurs Town, Cat Island. Determined by Mr. C. B. Robinson.

Chara foliolosa Muhl. (*Chara gymnopus* A. Br. forma *Humboldtii* A. Br.). In a slightly brackish pool, Mt. Vernon, Nassau. Determined by Mr. C. B. Robinson.

PHÆOPHYCEÆ.[16]

Cystoseira myrica (Gmel.) Ag. Gregory Town, Eleuthera.

Turbinaria turbinata (L.) Kuntze. Spanish Wells, George Island.

Sargassum bacciferum (Turn.) Ag. Atlantic Ocean, south of Gulf Stream.

Sargassum pteropleuron Grun. Taken in the Atlantic Ocean off Hatteras, and again south of Gulf Stream.

Sargassum filipendula Ag. forma *laxum* J. Ag. Atlantic Ocean, south of Gulf Stream.

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[16] Determined by Dr. M. A. Howe.

† Determined by Mr. C. B. Robinson.

Sargassum bacciferum (Turn.) Ag. Atlantic Ocean, south of Gulf Stream.
Sargassum sp. (?) Immature and sterile. West shore of Eleuthera, Current Settlement.

DICTYOTALES.[17]

Gymnosorus variegatus (Lamour.) J. Ag. (*Zonaria variegata* Lamour). Green Cay; on floating *Sargassum* off Hatteras.
Padina durvillæi Bory. On rocks, Eleuthera, opposite Current Settlement.
Neurocarpus justii (Lamour.) Kuntze. Thrown up on the beach at Hope Town, Abaco.
Dictyota dentata Lamour. Gregory Town, Eleuthera.
Dictyota bartayresiana Lamour. On rocks, Eleuthera, opposite Current Settlement.
Dictyota fasciola (Roth) Lamour. Gregory Town, Eleuthera.

RHODOPHYCEÆ.[18]

Liagora annulata J. Ag. Gregory Town, Eleuthera. Somewhat resembling *Liagora valida* in habit, but clearly distinct—firmer, beautifully annulate from near the base to the partially calcified apices; the apices are rounded-obtuse in fluid-preserved material, but often become attenuate acuminate on drying. The annulations appear to be due to unequal calcification in well-defined alternating zones.
Galaxaura lapidescens (Ell. & Soland.) Lamour. On rocks, west shore, Eleuthera. Current Settlement.
Cordylecladia irregularis Harv. West shore, Eleuthera, Current Settlement.
Laurencia papillosa (Forsk.) Grev. Gregory Town, Eleuthera.
Laurencia tuberculosa gemmifera (Harv.) J. Ag. Mangrove Cay, Andros; Green Cay; dredged in 4 fathoms.
Chondria dasyphylla (Woodw.) Ag. (?). Mangrove Cay, Andros.
Chondria sedifolia Harv. Mangrove Cay, Andros.
Digenea simplex (Wulf.) Ag. Gregory Town, Eleuthera.
Bostrychia montagnei Harv. Mt. Vernon, Nassau.
Herposiphonia pecten-veneris (Harv.) Falkenb.
Amansia multifida Lamour. Gregory Town, Eleuthera.
Dasya gibbesii Harv. Gregory Town, Eleuthera; Mangrove Cay, Andros.
Spyridia filamentosa (Wulf.) Harv.
Ceramium byssoideum Harv. Mangrove Cay, Andros.
Centroceras clavulatum (Ag.) Mont. West shore, Eleuthera; on floating *Sargassum* in Gulf Stream, off North Carolina.
Corallina subulata Ell. & Soland. Attached to the above, Gregory Town, Eleuthera.
Jania capillacea Harv. On floating *Sargassum*, Atlantic Ocean, off North Carolina.

FUNGI.[19]

TREMELLINEÆ.

Auricularia nigra (Sw.) Burt. (*Hirneola nigra* (Sw.) Fr., *Peziza nigra* Sw.). Near Nassau; Mangrove Cay, Andros.

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[17] Determined by Dr. M. A. Howe.
[18] Determined by Dr. M. A. Howe.
[19] Determined by Dr. Geo. F. Atkinson.

Dacryomycetineæ.

**Guepinia palmiceps* Berk. (?). On dead limbs, Soldiers road, New Providence. Widely distributed in tropical countries.

Hymenomycetineæ.

**Amanitopsis farinosa* Schw. In dry soil, Watlings Island, New Providence. Distribution: North Carolina, New York.

Collybia sp. (?). Near *C. lacerata*, but spores long, narrow, tapering at base, 9-12 x 3-5 mm. On rotting wood, Soldiers road, New Providence.

**Lentinus strigosus* Fr. On dead stems of palms, Watlings Island, on decayed wood; Mt. Vernon, Nassau. Distribution: North Carolina, Ceylon, Cuba.

**Marasmius bermudensis* Berk. (or near). Mt. Vernon, Nassau. Distribution: Bermudas.

**Marasmius opacus* B. & C. (or near). On leaves, Soldiers road, Nassau. Distribution: North Carolina, Central America, New South Wales, Australia.

**Marasmius nidulus* B. & C. (?). New Providence. Distribution: Cuba, Central America.

**Marasmius ramealis* (Bull.) Fr. New Providence. Distribution: Europe, North America.

**Marasmius rotula* (Scop.) Fr. Small form, on dead sticks, Mt. Vernon, Nassau. Widely distributed.

**Marasmius vaillantii* Fr. (?). On banana leaves, Mangrove Cay, Andros. Distribution: England, South Carolina.

Schizophyllum alneum (L.) Schroet. New Providence. Cosmopolitan.

**Favolus alutaceus* B. & Mont. Mangrove Cay, Andros. Distribution: Brazil, Maine, Malacca.

**Polyporus occidentalis* Kl. (?). On dead trunks, Mangrove Cay, Andros; Little Mangrove Cay, Andros. Widely distributed.

Polyporus sp. (?). Young stage at base of trees, New Providence.

**Polyporus guyanensis* Mont. Mangrove Cay, Andros. Distribution: Central America, Brazil.

**Polystictus abietinus* Fr. On dead pine, Soldiers road, Nassau. Distribution: Europe, North America and Arctic regions.

**Polystictus hirsutus* Fr. On dead wood, Grants Town, Nassau; Mangrove Cay, Andros. Cosmopolitan.

Polystictus sanguineus (L.) Mey. On dead limbs, New Providence. Widely distributed.

**Trametes hydnoides* (Swartz.) Fr. New Providence. Widely distributed in tropical America.

Lycoperdineæ.

Diplocystis wrightii B. & C. On ground, dry hillside, Clarence Harbor, Long Island. Found on Inagua by Hitchcock and on Andros by Northrop. Reported only from the Bahamas and Cuba.

Pyrenomycetineæ.

Xylaria sp. Mangrove Cay, Andros (Sterile).

FIG. 1.—VEGETATION ON SANDY AND ROCKY SHORE, WATLINGS ISLAND

FIG. 2.—VEGETATION ON ROCKY BEACH, WATLINGS ISLAND

VIEWS ILLUSTRATING VEGETATION

LICHENES.[20]

**Arthonia spectabilis* Flo. On bark, Spanish Wells, George Island (47).
**Arthonia cinnabarina* Wall. On leaf stalk of Palmetto, Arthurs Town, Cat Island (51).
**Buellia disciformis* Fr. On a tree, Mt. Vernon, Nassau (13).
**Cœnogonium disjunctum* Nyl. On bark, Mt. Vernon, Nassau (29).
**Chiodecton sphærale* Nyl. On wood, Mangrove Cay, Andros (43).
**Graphis elegans* Ach. On trees, Mt. Vernon, Nassau, and Little Mangrove Cay, Andros (3, 42).
**Graphis achariana* Tuck. On mango tree, Mt. Vernon, Nassau (6).
**Graphis afzelii* Ach. On a tree, Mt. Vernon, Nassau (14).
**Graphis nitida* Nyl. On bark, Mt. Vernon, Nassau (21).
**Graphis dumastii* (Fée) Nyl. On bark, Mt. Vernon, Nassau (30).
**Graphis poitæoides* Nyl. On bark, Mangrove Cay, Andros (44).
**Graphis radiata* Montagne. On bark, Mangrove Cay, Andros (45).
**Gyalecta lutea* (Dicks) Tuck. Near Mermaid Pool, Mt. Vernon, and along Soldiers road, Nassau (11, 26).
**Glyphis cicatricosa* Fr. On bark, Powells Point, Eleuthera (50).
**Heterothecium domingense* (Pers.) Flotow. On bark, Mt. Vernon, Nassau (20).
**Heterothecium tuberculosum* (Fée) Flotow. On trees, Soldiers road, Nassau (28).
**Leptogium marginellum* Sm. On bark, Blue Hills road, New Providence (25).
**Lecanora pallida* Schaerer. On trees, Little Mangrove Cay, Andros, Spanish Wells, George Island (39, 46).
**Lecanora varia* Nyl. On mango tree, Little Mangrove Cay, Andros (34).
**Opegrapha varia* Ach. On bark, Soldiers road, Nassau (27).
**Pyxine cocoes* (L.) Fr. On mango tree, Mt. Vernon, Nassau; Powells Point, Eleuthera (7, 49).
**Pyrenula mamillana* Ach. On mango tree, Mt. Vernon, Nassau (8).
**Pyrenula aurantiaca* Fée. On mango tree, Little Mangrove Cay, Andros (33).
**Pyrenula leucoplaca* Kbr. On mango tree, Little Mangrove Cay, Andros (36).
**Pyrenula fallaciosa* Tuck. On mango tree, Little Mangrove Cay, Andros (40).
**Parmelia citrata* Ach. On rocks, Mt. Vernon, Nassau (9).
**Parmelia latissima* Fée. On mango tree, Little Mangrove Cay, Andros (38).
**Pertusaria leioplaca* Kbr. On a scrub, Blue Hills, New Providence (24).
**Pertusaria velata* Nyl. On mango tree, Little Mangrove Cay, Andros (37).
**Pannaria molybdæa* (Pers.) Tuck. On bark, Mt. Vernon, Nassau (19).
**Ramalina calicaris* Fr. On mango tree, Mt. Vernon, Nassau (4).
**Ramalina gracilis* (Pers.) Nyl. On trees, Watlings Island (52).
Trypethelium cruentum Montagne. On bark of mango tree, Mt. Vernon, Nassau (1).
**Trypethelium sprenglii* Ach. On mango tree, Mt. Vernon, Nassau (5).
**Trypethelium madreporiforme* Eschw. On trees, Mt. Vernon, Nassau; Little Mangrove Cay, Andros (12, 41).
**Trypethelium ocholeucum* var. *pallescens* Mull. On bark, Mt. Vernon, Nassau (15).
**Trypethelium interpositum* Nyl. On trees, Mt. Vernon, Nassau (31).
**Thelotrema microporum* Montague. At base of scrub, salt flats, near Nassau (23).
**Verrucaria virens* Nyl. On rocks, Mt. Vernon, Nassau (22).
Blodgettia confervoides Harv. Green Cay, west shore Eleuthera, Current Settlement. A marine lichen. (See Wright: Trans. Irish Acad. 28:21, pl. 2, 1881.) Determined by Dr. M. A. Howe.

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[20] All but the last determined by Mr. W. W. Calkins.

HEPATICÆ.[21]

**Frullania gibbosa* Nees. On trees, Soldiers road, Nassau.

**Frullania squarrosa* (R. Bl. & N.) Dum. On trees, Mt. Vernon and Soldiers road, Nassau.

**Mastigolejeunia auriculata* (Wils. & Hook.) Schiffn. On trees, Mt. Vernon and Southeast road, Nassau. Contained rotifers in the saccate under lobes of the leaves.

**Brachiolejeunea corticalis* (Lehm. & Lindenb.) Schiffn. On trees in high coppice near beach, ten miles west of Nassau. Also along Soldiers road, Nassau.

**Cheilolejeunea phyllobola* (Nees & Mont.) Schiffn. On trees and rocks, Mt. Vernon, and along Soldiers road, Nassau.

**Microlejeunea lucens* (Tayl.) Evans. At base of tree, Mt. Vernon, Nassau.

**Microlejeunea bullata* (Tayl.) Evans. On trees, Soldiers road, Nassau.

**Diplasiolejeunea unidentata* (Lehm. & Lindenb.) Schiffn. On trees, Soldiers road, Nassau.

MUSCI.[22]

Octoblepharum albidum Hedw. At base of trees, Mt. Vernon, Nassau. Widely distributed.

Barbula agraria (Sw.) Brid. (*Tortula agraria* Sw.). In a banana hole, Soldiers road, Nassau. Distribution: Florida, West Indies and South America.

**Calymperes disciforme* C. M. On trees, Mt. Vernon, Nassau. In reference to this species, Mrs. Britton says: "It has been reported from the Antilles and Martinique as well as from Florida. It agrees with Austin's specimens from Caloosa, Florida, although one of the main characters of the leaves is so misleading that one would naturally place it in an entirely different section . . . the margin is said to be hyalin, but this is not true."

PTERIDOPHYTA.[23]

Ornithopteris adiantoides (Sw.) Presl. In a barren field, Soldiers road, Nassau (49). Abundant in the pine-barrens on New Providence.

Asplenium dentatum L. The Caves, New Providence (17).

Pteris longifolia L. Banana hole by Soldiers road, New Providence (48).

Polypodium polypodioides (L.) Hitch. Mt. Vernon, Nassau (120).

Camplyoneuron phyllitidis (L.) Presl. On trees, Mt. Vernon, Nassau (122).

Adiantum capillus-veneris L. In a banana hole, Mt. Vernon, Nassau (130).

Adiantum melanoleucum Willd. In a banana hole, Tarpum Bay, Eleuthera (396).

Dryopteris patens (Sw.) Kuntze. In banana holes, East road, Nassau; Mangrove Cay, Andros (136, 230).

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[21] Determined by Dr. Alexander W. Evans. All of these species are widely distributed in tropical America, *Frullania squarrosa* (R. Bl. & N.) Dum. being found also in the tropics of Asia, Africa and the Pacific Islands. All of the species, except *Frullania gibbosa* Nees. and *Diplasiolejeunea unidentata* (Lehm. & Lindenb.) Schiffn., are also known from the southern United States.—A. W. EVANS.

[22] Determined by Mrs. N. L. Britton.

[23] Ferns and Seed Plants followed by numbers, excepting Grasses, Sedges and Palms, were identified by Dr. N. L. Britton. Species not followed by numbers were identified by me, but not collected. Localities preceding numbers are the points of collection; those following numbers are points where the plants were seen but not collected. The latter are open to possibilities of error, and are given only for what they are worth.

Blechnum serrulatum Rich. Low, wet places, West road, Nassau (172).
Pteridium caudatum (L.) Kuhn. (May Pole.) Soldiers road, New Providence (254). Abundant in pine-barrens on New Providence and Abaco.
Geniopteris reptans Sw. In banana holes, Eleuthera, opposite Spanish Wells (331).
Odontosoria clavata (Sw.). In banana holes in pine-barrens, New Providence (297).
Phlebodium aureum (L.) R. Br. On trees, Eleuthera (335).
Acrostichum aureum L. (Wild Ginger). Very abundant in deep depressions, Mt. Vernon, Nassau.

CONIFERÆ.

Juniperus barbadensis L. Which Point, Abaco (568).
Pinus bahamensis Griseb. (*Pinus elliottii* Engelm.). New Providence; Abaco.

PHANEROGAMÆ.

TYPHACEÆ.

Typha domingensis Pers. Lake Killarney, New Providence; Arthurs Town, Cat Island; Watlings Island.

NAIADACEÆ.

Ruppia maritima L. In West lake, Watling Island (486).

ALISMACEÆ.

Sagittaria lancifolia L. In a fresh bay, West road, Nassau (176).

ELODEACEÆ.

**Halophilla engelmannii* Aschers. In shallow sea water, Mangrove Cay, Andros (577).

GRAMINEÆ.[24]

**Andropogon virginicus* L. Elbow Cay, Abaco (569).
**Andropogon tener* Kunth. Pine-barrens, New Providence (542).
Andropogon sp. (?) (Bed-grass). Pine-barrens, New Providence (548).

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[24] Determined by Dr. A. S. Hitchcock. In looking over the grasses Dr. Britton and Mr. Nash have altered a number of Dr. Hitchcock's identifications. For the sake of comparison we give these changed identifications as follows:

Distichlis spicata (L.) Greene (4, 491).
Uniola virgata (Poir.) Griseb. (7, 301, 349).
Stenotaphrum secundatum (Walt.) Kuntze (96, 261).
Capriola dactylea (L.) Kuntze (97).
Eustachys petræa (Sw.) Desv. (99, 350).
Paspalum sp. (197, 267).
Chætochla imberbis (Poir.) Scribn. (263).
Panicum maximum Jacq. (338).
Panicum proliferum Lam. (489).
Chætochloa caudata (Lam.) Scribn. (522).
Schizachyrium sp. (542).
Syntherisma fimbriatum (Link) Nash (570).

**Paspalum vaginatum* Sw. Fertile spot near beach, Watlings Island; South beach, New Providence (479, 546).

Paspalum caespitosum Fluegge. Little Mangrove Cay, Andros; Rock quarry, Nassau (197, 267).

**Panicum elephantipes* Nees (Guinea Grass). Fertile soil, Current Settlement, Eleuthera; sand near shore, Watlings Island (338, 489).

**Setaria macrostachya* H. B. K. Water Cay, Long Island (522). New Providence; Cat Island; Watlings Island; Mangrove Cay; Rum Cay.

**Setaria filiformis* Sw. Blue Hills, New Providence (304b).

Setaria glauca (L.) Scribn. Soldiers road, New Providence (263); Governors Harbor, Eleuthera; Cat Island; Watlings Island; Rum Cay.

Cenchrus tribuloides L. Beach near Nassau (101). Seen at nearly all points.

Panicum fimbriatum H. B. K. In a potato field, Elbow Cay, Abaco (570).

Sporobolus virginicus Kunth. Beach, Eleuthera; Current Settlement, Governors Harbor, Eleuthera; salt flats, Rum Cay; low savanna, Water Cay; Long Island; South beach, New Providence (346, 389, 439, 527, 547).

Sporobolus indicus (L.) R. Br. Rock quarry, Nassau (266).

Sporobolus jacquemontii Kunth. On beach and in pine-barrens, New Providence (95, 260, 550).

Cynodon dactylon (L.) Kuntze. Along roads, Nassau (97); Governors Harbor, Eleuthera.

Chloris petraea Desv. On beach and along Soldiers road, Nassau; Current Settlement, Eleuthera (99, 261, 350); Governors Harbor, Eleuthera; Cat Island; Rum Cay; Watlings Island; Long Island; Abaco.

Chloris barbata Nash (*C. polydactyla* Sw.). Soldiers road, New Providence (262); Rum Cay; Long Island.

Eleusine indica (L.) Gaertn. Grants Town, Nassau (285).

Uniola paniculata L. Beach near Nassau (109); seen in all the islands visited.

Uniola racemiflora Trin. (*U. virgata* (Poir.) Griseb.) Edge of a brackish pond near Nassau; on rocky coast, Current Settlement, Eleuthera (7, 349); abundant on the south shore of New Providence, and on dunes at Governors Harbor, Eleuthera.

Distichlis maritima Raf. Edge of brackish pond near Nassau; on fixed dunes, Watlings Island (4, 491), Abaco.

Stenotaphrum americanum Schk. Beach near Nassau (96). This and *Sporobolus jacquemontii* Kunth. form the turf of the golf links at Fort Charlotte, Nassau.

Arthrostylidium capillifolium Griseb. (Old Man's Beard). Blue Hills road, New Providence (46).

CYPERACEAE.[25]

**Cyperus vahlii* Steud. Edge of salt marsh, Clarence Harbor, Long Island (505).

Cyperus rotundus L. Grants Town, Nassau (290).

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[25] Determined by Dr. A. S. Hitchcock. In looking over the sedges Dr. Britton and Mr. Nash have altered a number of Dr. Hitchcock's identifications. For the sake of comparison we give these changed identifications as follows:

Fimbrystilis spadicea (L.) Vahl. (83, 449).

Cladium jamaicense Crantz (86).

Cyperus ottonis Baeckl. (189, 420).

Scleria lithosperma (L.) Sw. (304, 305).

Cyperus fuligineus Chapm. (505).

Cyperus brunneus Sw. Sandy soil near shore, Nassau; on beach, Powells Point, Eleuthera (189, 420); Governors Harbor, Eleuthera; Cat Island.
Eleocharis cellulosa Torr. In a shallow salt marsh, Powells Point, Eleuthera (419); Cat Island; Watlings Island.
Decromena colorata Hitch. Pine-barrens, New Providence (52); Cat Island.
Scirpus ferrugineus L. Wet pine-barrens, Lake Killarney, New Providence; salt flats, Rum Cay (83, 449).
**Schœnus nigricans* L. Rocks on border of a salt pond, Nassau (8).
Cladium effusum Torr. (*C. Jamaicense* L.) (Saw grass). Wet-barrens, Lake Killarney, New Providence (86); Cat Island; Watlings Island.

Palmæ.[26]

Inodes palmetto (Walt.) Cook (*Sabal palmetto* (Walt.) R. & S.) (Thatch palm). West road, New Providence; near shore, Watlings Island; Arthurs Town; Cat Island (437, 459, 530, 576); also at Current Settlement, Gregory Town and Tarpum Bay, Eleuthera. Affects borders of fresh or slightly brackish marshes.
Thrinax bahamensis Cook (Goat palm, Silver palm). Green Cay; border of the Eastern lake, Watlings Island; Nassau (250, 251, 481, 529, 539). Inhabits rocky ground in the interior.
Coccothrinax jucunda Sarg. (Silver-leaf palm, Silver-thatch palm). Green Cay; Spanish Wells, George Island; Watlings Island (248, 249, 306, 307, 490, 528); New Providence; Long Island. Inhabits dunes and sand plains near shore.
Cyclospathe northropi Cook (Hog-cabbage palm). In low coppice near shore. Powells Point, Eleuthera (414); Watlings Island; Long Island. Inhabits humus soil among rocks.

Bromeliaceæ.

Tillandsia utriculata L. Arthurs Town, Cat Island (435).
**Tillandsia aloifolia* Hook. Which Point, Abaco (575).

Commelinaceæ.

Rhœa discolor (L'Her.). Hance. Mt. Vernon, Nassau.

Smilacaceæ.

**Smilax beyrichii* Kunth. Pine-barrens, New Providence (51, 298).
Smilax havanensis Jacq. West road, Nassau, (108).
Smilax oblongata viscifolia (Duham) Schulz. Mt. Vernon, New Providence (33).

Amaryllidaceæ.

Agave rigida Mill. (Bamboo). Seen at Gregory Town, Governors Harbor and Tarpum Bay, Eleuthera.
Hymenocallis arenicola Northrop. West road, Nassau; Gregory Town, Current Settlement, Governors Harbor, and Powells Point, Eleuthera; Water Cay, Long Island; Abaco.

Dioscoraceæ.

Rajania hastata L. Pine-barrens, New Providence (54). Which Point, Abaco.

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[26] Determined by Dr. O. F. Cook.

ORCHIDACEÆ.

Bletia verecunda Sw. Rock holes in pine-barrens, New Providence (292).

Epidendrum gracile Lindl. On a rocky bluff, Current Settlement, Eleuthera (351).

Epidendrum fucatum Lindl. On trees, border of a *Conocarpus* flat, Which Point, Abaco (559).

Broughtonia lilacena Henfr. On barren rocks near sea, Current Settlement, Eleuthera (370).

Vanilla articulata Northrop. Soldiers road, Nassau (in flower); edge of *Conocarpus* flat, East lake, Watlings Island (in fruit) (578, 579).

CASUARINACEÆ.

Casuarina equisetifolia Forst. (Spanish Cedar). Naturalized on New Providence and at Governors Harbor, Eleuthera.

MYRICACEÆ.

Myrica cerifera L. (Wax-berry). On edge of a fresh-water bay near Lake Killarney. New Providence (165). Also in similar situations, West road, New Providence, and on Cat Island, and Abaco. Said to have been introduced from the United States.

MORACEÆ.

Ficus jacquinifolia Rich. (Fig-tree). Mangrove Cay, Andros (209).

**Ficus sapotifolia* Kunth & Benche. (Fig-tree). Mangrove Cay, Andros; Thompson's Folly, Nassau (215, 294).

Ficus brevifolia Nutt. (*F. populnea* var. *bahamensis* Urban) (Fig-tree). Arthurs Town, Cat Island; Clarence Harbor, Long Island (433, 512).

ULMACEÆ.

Trema lima (Lam.) Hitch. (Mahoe). East road, Nassau; Mangrove Cay, Andros; Spanish Wells, George Island (141, 212, 312).

URTICACEÆ.

Fleurya æstuans (L.) Gaud. Grants Town, Nassau (288).

LORANTHACEÆ.

Dendropemon purpureus (L.) Kr. & Urb. On trees, Thompson's Folly, Nassau (296).

Phorodendron spathulifolium Kr. & Urb. On *Swietenia mahagoni*, Blue Hills, New Providence, Which Point, Abaco (303, 558).

POLYGONACEÆ.

Coccolobis krugii Lindau. Low coppice, Watlings Island (473).

Coccolobis retusa Griseb. On east side of hills, Gregory Town, Eleuthera (358).

Coccolobis diversifolia Jacq. Clarence Harbor, Long Island (520).

Coccolobis laurifolia Jacq. (Pigeon Plum). Low coppice, Green Cay (238). Seen on all islands visited except Rum Cay.

Coccolobis uvifera (L.) Jacq. (Sea Grape). Common on the shores of all the islands visited.

Fig. 1.—Vegetation on sandy beach, New Providence

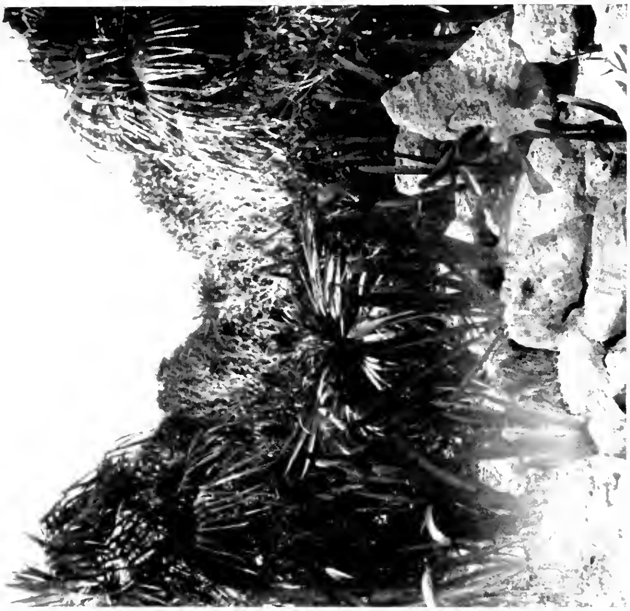

Fig. 2.—Vegetation on sandy beach, Green Cay

VIEWS ILLUSTRATING VEGETATION

CHENOPODEÆ.

**Chenopodium spathulatum* Sieb. Gregory Town, Eleuthera (373).

Atriplex cristata H. B. K. Powells Point, Eleuthera (416).

Salicornia ambigua Michx. Port Nelson, Rum Cay (448); Which Point, Abaco.

AMARANTACEÆ.

Lithophila vermicularis (L.) Uline. North beach west of Nassau; Little Mangrove Cay, Andros; edge of West lake, Watlings Island (37, 201, 476).

**Alternanthera maritima* St. Hil. Little Mangrove Cay, Andros (196).

Alternanthera repens (L.) Kuntze. A weed in door-yards, Spanish Wells, George Island (313).

Iresine paniculata (L.) Kuntze. In sand near shore, Mangrove Cay, Andros; Tarpum Bay, Eleuthera (214, 407).

**Amaranthus tristis* L. Soldiers road, Nassau (264). A weed.

BATIDEÆ.

Batis maritima L. Shore of West lake, Watlings Island (482); Elbow Cay, Abaco.

PHYTOLACCACEÆ.

Rivina humilis L. Near The Caves, New Providence; Mangrove Cay, Andros; Arthurs Town, Cat Island (76, 210, 424).

Rivina lævis L. In the coppice, Elbow Cay, Abaco (572).

**Petiveria alliacea* L. Grants Town, Nassau (293).

NYCTAGINACEÆ.

**Torrubia obtusata* (Jacq.) Britton. Low coppice, New Providence (5, 252).

Torrubia longifolia (Heimerl) Britton (Blolly-bush). Nassau; near shore, Spanish Wells, George Island; Watlings Island (15, 41, 316, 472); seen at most points visited. This is the plant identified by Northrop as *Pisonia obtusata* Sw.

**Torrubia cokeri* Britton. Tarpum Bay, Eleuthera (401); low coppice, New Providence. A new species described by Dr. Britton in the Bulletin of the Torrey Botanical Club for November, 1904.

Bœrhaavia paniculata Rich. Current Settlement, Eleuthera (344).

Bœrhaavia scandens L. Gregory Town, Eleuthera (374).

AIZOACEÆ.

Sesuvium portulacastrum L. On sandy beaches of all the islands visited.

PORTULACEÆ.

Portulaca oleracea L. East road, Nassau; Mangrove Cay, Andros (131, 219, 221).

Portulaca pilosa L. Among dry rocks, Port Nelson, Rum Cay (440).

Portulaca halimoides L. Mount Vernon, Nassau; Mangrove Cay, Andros (128, 220).

ANONACEÆ.

Anona palustris L. (Custard apple, Pond apple). In brackish bays, New Providence, Cat Island; Tarpum Bay, Eleuthera.

NYMPHÆACEÆ.

**Castalia ampla* (DC.) Green. In a fresh pond, Arthurs Town, Cat Island (434).

LAURACEÆ.

Ocotea catesbyana (Mich.) Sarg. Low coppice, Mt. Vernon, Nassau (30).

Cassytha filiformis L. Parasitic on trees and scrubs, Nassau (112). Also on Mangrove Cay, Andros; Green Cay; Watlings Island; Long Island; Abaco.

LYTHRACEÆ.

Ammania latifolia L. On margin of a brackish marsh, Watlings Island (460).

CRUCIFERÆ.

Cakile æqualis L'Her. Governors Harbor, Eleuthera (385).

Lepidium virginicum L. A weed introduced about Nassau.

CAPPARIDACEÆ.

**Capparis jamaicensis* Jacq. (Wild Orange). Clarence Harbor, Long Island (497, 506). On vigorous young shoots the leaves are long and narrow.

CRASSULACEÆ.

Bryophyllum pinnatum (Lam.) Krug. (Live-forever). New Providence; Tarpum Bay, Eleuthera; Cat Island.

ROSACEÆ.

Chrysobalanus icaco L. (Cocoa plum, Pigeon plum). West road, Nassau (88). On the shores of all the islands visited. Fruit pink.

Chrysobalanus fellocarpus Meyer (Cocoa plum, Pigeon plum). Common, with the above, on all the islands visited. Fruit black.

MIMOSACEÆ.

Acacia choriophylla Benth. (Cinnecord). Mangrove Cay, Andros (207). Common on all the islands visited.

Leucæna glauca (L.) Benth. (Jumby-bean). Nassau (38). Gregory Town, Eleuthera. A common weed in old fields.

Lysiloma latisiliqua (L.) Benth. (*L. bahamensis* Benth.) (Wild Tamarind). Soldiers road, Nassau (47). Mangrove Cay, Andros; Cat Island; Long Island.

Lysiloma paucifolia (DC.) A. S. Hitch. (Horseflesh, Sabicu). Not uncommon on New Providence, Andros and Eleuthera.

Calliandra formosa Benth. Eleuthera, opposite Spanish Wells (321); Gregory Town, Eleuthera. Leaves sensitive. Only a few specimens found.

Calliandra hæmatomma (DC.) Benth. (Brier-tree). Watlings Island (484). Also on Abaco. Abundant in low coppice.

Pithecolobium hystrix Benth. Killarney pine-barrens, New Providence (182).

**Pithecolobium mucronatum* Britton (sp. nov.†). A scrub about 2 m. high, the young shoots and peduncles sparingly pubescent. Leaves with two pairs of leaflets, the petiole 1 cm. long or less, longer than or equalling the stiff, sharp, puberulent, stipular spines, and mostly longer than the petiolules; leaflets coriaceous, rather narrowly obovate, 2 cm. long or less, glabrous, bright green and shining above, pale green and dull beneath, the midvein excurrent as a mucro 0.5-1 mm. long; peduncles axillary to the upper leaves and much exceeding them, slender, 5 cm. long or less, erect-ascending; inflorescence puberulent;

† Species thus designated have been described by Dr. M. L. Britton, and are here published for the first time.

flowers pink; calyx-lobes, ovate, acute; corolla-lobes ovate to ovate-lanceolate. Dry thicket near Clarence Harbor, Long Island, W. C. Coker, July 16, 1903 (518). Not common (518).

Pithecolobium keyense Britton (Ram's horn). Nassau (57). Common near the coast on both sides of New Providence, and on all the other islands visited.

Pithecolobium bahamense Northrop. East road, Nassau (159).

CASSICEÆ.

Cæsalpinia bahamensis Lam. Lake Killarney pine-barrens, and West road, New Providence (1, 84, 166).

Cæsalpinia lucida Urban. Gregory Town, Eleuthera (360).

Cæsalpinia sp. (?). Thick coppice near lake, Watlings Island (470).

**Cæsalpinia vesicaria* L. (Braziletto). Clarence Harbor, Long Island (516).

Cassia bahamensis Mill. (Stinking Pea). Blue Hills road, New Providence (9); Current Settlement, Gregory Town, and Tarpum Bay, Eleuthera; Cat Island; Rum Cay; Long Island. A common weed.

**Cassia lineata* Sw. Blue Hills road, New Providence; Green Cay (10, 245).

Cassia occidentalis L. Nassau, Tarpum Bay, Eleuthera (178, 279, 403).

**Cassia aspera* Mich. Tarpum Bay, Eleuthera (402).

Guilandina major (DC.) Small (Nicker bean). Common near shore on New Providence. Beans slate color.

Guilandina crista (L.) Small (Nicker bean). Common near shore on New Providence. Beans red.

Hæmatoxylon campechianum L. (Logwood). Current Settlement, Eleuthera; Clarence Harbor, Long Island; New Providence.

PAPILIONACEÆ.

Crotalaria verrucosa L. Low, dry plane, Clarence Harbor, Long Island (499).

Abrus precatorius L. (Bead-vine, Wild Licorice, Crab's eyes). Near Mt. Vernon, Nassau (115).

Cajanus cajan (L.) Millsp. (Pigeon pea). Mangrove Cay, Andros (206); Watlings Island.

Meibomia supina (Sw.) Britton. Grants Town, Nassau; Gregory Town, Eleuthera (281, 359).

Ichthyomethia piscipula (L.) Hitch. (Dogwood). Mangrove Cay, Andros; Eleuthera, opposite Spanish Wells (233, 327). Tarpum Bay and Current Settlement, Eleuthera; Cat Island; Watlings Island; Which Point, Abaco.

Stylosanthes hamata (L.) Taub. In streets of Current Settlement, Eleuthera; pine-barrens, New Providence (339, 541).

Galactia spiciformis T. & G. Governors Harbor, Eleuthera; Elbow Cay, Abaco (386, 571).

Galactia bahamensis Urban. Port Nelson, Rum Cay (454).

Galactia rudolphioides (Griseb.) Benth & Hook. Pine-barrens, New Providence; Gregory Town, Eleuthera (55, 368).

Sophora tomentosa L. Near coast, Port Nelson, Rum Cay (446).

Cracca cinerea (L.) Morong. Sandy soil, Port Nelson, Rum Cay (450).

Dalbergia ecastophyllum (L.) Taub. (Titi). West road, 8 miles from Nassau, margin of brackish pond near beach, Watlings Island (170, 458).

Canavalia obtusifolia (Lam) DC. (Horse bean). Sandy places near the shore, New Providence; Spanish Wells, George Island; Cat Island; Rum Cay; Mangrove Cay; Long Island.

Canavalia sp. Edge of town, Tarpum Bay, Eleuthera (411).

OXALIDACEÆ.

Oxalis corniculata L. Grants Town, Nassau (275).

ZYGOPHYLLACEÆ.

Guaiacum sanctum L. (Lignum vitæ). Green Cay (235); Green Cay; Rum Cay; Watlings Island; Clarence Harbor, Long Island.

LINACEÆ.

Erythroxylon brevipes DC. (Sareto). Low coppice, New Providence; Powells Point, Eleuthera; Arthurs Town, Cat Island; Clarence Harbor, Long Island (137, 421, 427, 509); Abaco. Fruit of this or the following species was found in stomachs of Iguanas killed on Watlings Island.

Erythroxylon obovatum MacF. Blue Hills, New Providence; Mangrove Cay, Andros; Clarence Harbor, Long Island (508, 222, 555).

Linum bahamense Northrop. On the beach, Which Point, Abaco (566).

MALPIGHIACEÆ.

Triopteris rigida Sw. East road, Nassau; Watlings Island (40, 477); Long Island.

Byrsonima lucida (Sw.) DC. (Sweet Margaret). Killarney barrens, New Providence (65); Watlings Island; Cat Island; Abaco.

Stigmatophyllon sagraeanum Juss. Mangrove Cay, Andros; Clarence Harbor, Long Island (223, 502).

Malpighia polytricha Juss. (Touch-me-not). Spanish Wells, George Island (311). On fixed dunes, Governors Harbor, Eleuthera; New Providence; Long Island.

Bunchosia glandulosa (Cav.) Rich. Killarney pine-barrens, New Providence; Current Settlement and Governors Harbor, Eleuthera (64, 348). Not common at any point.

RUTACEÆ.

Fagara fagara (L.) Small (Wild Lime). Low coppice, Nassau (32). Common on Eleuthera, and Cat Island.

Fagara flava (Vahl). Kr. & Urb. (Yellow-wood, Doll-bush). Elbow Cay, Abaco (574).

Fagara coriacea (A. Rich.) Kr. & Urb. (Hercules' club, Doctor's club). Mangrove Cay, Andros; Clarence Harbor, Long Island (232, 511).

Picramnia pentandra Sw. Tarpum Bay, Eleuthera (400).

**Simaruba glauca* Kunth. (Bastard Mastic). High coppice, Blue Hills road, New Providence (538).

TEREBINTHACEÆ.

Amyris elemifera L. (White Torch). Low coppice, Watlings Island (464); Spanish Wells, George Island; Long Island.

SIMARUBACEÆ.

Picramnia pentandra Sw. East road, Nassau (147).

Picrodendron baccatum bahamense Kr. & Urb. Rocky coppice, Current Settlement, Eleuthera (352). Only a few specimens seen.

Suriana maritima L. (Bay Cedar). Along the shores of all the islands visited.

BURSERACEÆ.

Swietenia mahogani L. (Mahogany, Madeira). Low coppice, Soldiers road, New Providence (153, 259); Powells Point, Eleuthera; Rum Cay; Abaco.

Bursera simaruba (L.) Sarg. (Gum-elemi). Common on New Providence, Eleuthera; Watlings Island; Long Island; Abaco.

MELIACEÆ.

Melia azedarach L. (China-tree). Tarpum Bay, Eleuthera (413).

EUPHORBIACEÆ.

Croton eleuteria (L.) Sw. (Cascarilla, Sweet-wood bark). Low coppice, Nassau (3a).

Croton linearis Jacq. (Granny-bush). Near shore, New Providence; Governors Harbor, Eleuthera (23, 387); Tarpum Bay and Powells Point, Eleuthera; Long Island.

Croton lucidus L. Opposite Spanish Wells, George Island; Watlings Island (326, 471).

**Croton discolor* Willd. Port Nelson, Rum Cay (453).

Croton lobatus L. Pine-barrens, New Providence (553).

Phyllanthus epiphyllanthus L. (Hardhead). Mt. Vernon, Nassau; Clarence Harbor, Long Island (31, 524); common on Eleuthera, Cat Island; Watlings Island.

Phyllanthus niruri L. Mangrove Cay, Andros (227).

* *Phyllanthus virens* Muell. Arg. Opposite Spanish Wells, George Island (328); a clambering scrub.

Euphorbia punicea Sw. Small Cay in lake, Watlings Island (487).

**Euphorbia havanensis* Willd. Banana field, Soldiers road, Nassau (45).

Euphorbia buxifolia L. On beach, New Providence (114); on sandy beaches of all the islands.

Euphorbia pilulifera L. Eleuthera, opposite Spanish Wells (319); among cocoanut palms near shore.

**Euphorbia brasiliensis* L. Gregory Town, Eleuthera (371).

**Euphorbia cayensis* Millsp. On beach, Rum Cay (452); Abaco. A new species, first collected by us; afterward collected and named by Dr. Millspaugh.

Buxus bahamensis Baker. Killarney pine-barrens, New Providence; Watlings Island (68, 474).

**Savia bahamensis* Britton (Joe-wood, Bastard Crab-wood). Low coppice, East road, Nassau (157, 160). A new species described by Dr. Britton in Torreya, July, 1904.

Gymnanthes lucida Sw. (Crab-wood). Spanish Wells, George Island; Watlings Island (314, 467); Gregory Town, Eleuthera; Long Island; Abaco.

Bernardia bernardia (L.) Britton (*Bernardia carpinifolia* Griseb.). Tarpum Bay, Eleuthera (405).

Argythamnia candicans Sw. Tarpum Bay, Eleuthera (409).

Hippomane mancinella L. (Manchineel). Low coppice, Watlings Island (468, 485).

Excæcaria sagræi Muell. Low coppice Watlings Island (478).

**Bonamia cubana* A. Rich. Low, dry coppice, Arthurs Town, Cat Island (428).

Drypetes lateriflora (Sw.) Kr. & Urb. Blue Hills, New Providence (535).

**Pera bumeliafolia* Griseb. (Brown Ebony). High coppice at junction of Soldiers road and Blue Hills road, New Providence (537). A large tree.

**Securinego acidothamnus* (Griseb.) Muell. Arg. Base of a rocky hill, Mangrove Cay, Andros (225). Not before known north of St. Thomas.

ANACARDIACEÆ.

Metopium metopium (L.) Small (Poison-wood). Common on New Providence; Mangrove Cay; Andros; and Abaco. Less common on Eleuthera; Cat Island; Rum Cay and Watlings Island.

CELASTRACEÆ.

Crassopetalum pallens (Smith) Northrop. Mangrove Cay, Andros; Current Settlement, Eleuthera (231, 341).

Maytenus buxifolia (Rich.) Griseb. (Spoon-wood). Clarence Harbor, Long Island; low coppice, Watlings Island (494, 475).

**Gyminda grisebachii* Sarg. Clarence Harbor, Long Island (504).

Schæfferia frutescens Jacq. West road, Nassau (72).

ILICACEÆ.

Ilex krugiana Loes. High coppice, Blue Hills road, New Providence (536); Watlings Island.

Ilex repanda Griseb. High coppice, Blue Hills road, New Providence (552).

SAPINDACEÆ.

Thouinia discolor (Griseb.) (Hard-bark, Quicksilver-bush). East road, Nassau; Eleuthera, opposite Spanish Wells (143, 329). Watlings Island.

Hypelate trifoliata Sw. (Candle-wood, Red-wood). East road, Nassau; Mangrove Cay, Andros; Clarence Harbor, Long Island (152, 234, 493).

Exothea paniculata (Juss.) Radlk. (Butter-bough). East road and Blue Hills road, New Providence; Tarpum Bay, Eleuthera (149, 399, 534); Abaco. Berries said to be poisonous.

Melicocca bijuga L. (Genipe). East road, Nassau (154).

Serjania subdentata (Juss.) Poir. (Foul-foot vine). Mangrove Cay, Andros; Eleuthera, opposite Spanish Wells (217, 333).

Serjania diversifolia Radlk. (Foul-foot vine). Gregory Town, Eleuthera (357).

Cardiospermum halicacabum L. (Balloon-vine). Tarpum Bay, Eleuthera (397). Probably introduced.

Dodonæa viscosa L. (Candle wood). Port Nelson, Rum Cay; near the beach, Which Point, Abaco (444, 567).

RHAMNACEÆ.

Reynosia septentrionalis Urban (Darling plum, corrupted by the natives to Dorlin plum). West road, Nassau; Spanish Wells, George Island (24, 309). Gregory Town, Powells Point, and Tarpum Bay, Eleuthera; Cat Island; Watlings Island; Long Island; Rum Cay.

Krugiodendron ferreum (Vahl.) Urban (Iron-wood, Hard-wood). East road, Nassau; Clarence Harbor, Long Island (42, 503).

Colubrina colubrina (L.) Millsp. (Wild Coffee). In sand near beach, Green Cay; Rum Cay (240, 442); Long Island.

Colubrina reclinata (L'Her.) Brogn. Clarence Harbor, Long Island (519).

Gouania domingensis L. (Chew Stick). Not uncommon in the coppice on New Providence and Eleuthera.

VITACEÆ.

Cissus sicyoides L. Mt. Vernon, Nassau; Gregory Town, Eleuthera (117, 380).

Cissus sp. Blue Hills, New Providence (304).

Cissus acida L. Clarence Harbor, Long Island (498).

FIG. 1.—WHITE LILIES (HYMENOCALLIS ARENICOLA) IN FLOWER, WEST SHORE, ELEUTHERA

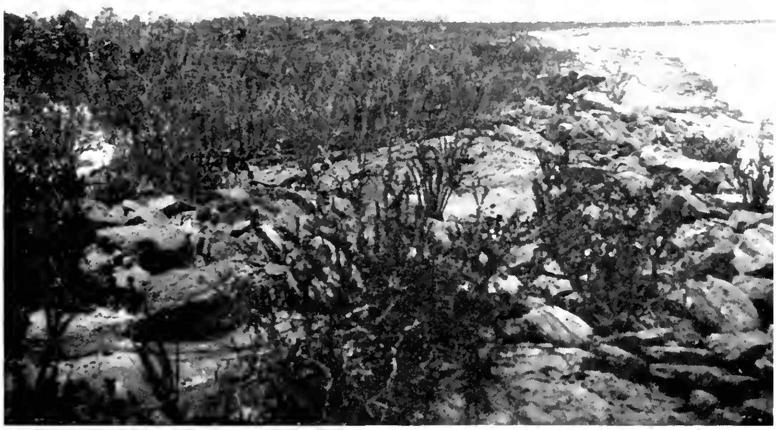

FIG. 2.—VEGETATION ON ROCKY SHORE, NEAR CLARENCE HARBOR, LONG ISLAND

VIEWS ILLUSTRATING VEGETATION

Cissus microcarpa Vahl. (Bull-vine). Nassau.

Vitis rotundifolia Mich. Pine-barrens, Blue Hills road, New Providence.

Parthenocissus quinquefolia (L.) Planch. Seen in a rocky clearing on Mangrove Cay, Andros; and among almost bare rocks on top of a hill at Gregory Town, Eleuthera; also at Current Settlement and Tarpum Bay, Eleuthera.

TILIACEÆ.

Corchorus hirsutus L. Near shore, New Providence; in a potato field, Elbow Cay, Abaco (39, 573).

MALVACEÆ.

Sida carpinifolia L. Mt. Vernon, and Rock Quarry, Nassau; Current Settlement, Eleuthera (133, 270, 343).

Sida ciliaris L. Current Settlement, Eleuthera (340). Prostrate on exposed rocks.

Abutilon crispum (L.) Medic. Clearing in coppice, Current Settlement, Eleuthera (345).

Gossypium barbadense L. (Cotton). Top of a barren, rocky hill, Rum Cay (456).

Pavonia spinifex (L.) Cav. Clarence Harbor, Long Island (495). Also seen at Lake Killarney, New Providence.

Malvaviscus cokeri Britton (sp. nov.?). A scrub, 2 m. high or less, with round glabrous branchlets. Leaves ovate, acuminate, cordate, thin, 7-nerved, entire or slightly repand, the upper surface glabrous but papillose, the under side glabrous except for tufts of hairs in the axils of the principal veins, and a few scattered ones on the veins, the blades 5 or 6 cm. long, 3 or 4 cm. wide, the petioles slender, 1.5-2.5 cm. long; peduncles slender, puberulent, 2 or 3 times as long as the petioles; involucrebracts narrowly linear, acuminate, glabrous, 1 cm. long, 1.5 mm. wide, about as long as the calyx; calyx-lobes triangular-ovate, acuminate, about one-half as long as the tube, woolly within; petals about 2 cm. long; stamen-column 3 cm. long or more. Foot of a dry, rocky hill, interior of Watlings Island (483). Bahamas, W. C. Coker, July 12, 1903.

STERCULIACEÆ.

Helicteres spiralis Northrop. Mt. Vernon, Nassau; Governors Harbor, Eleuthera (44, 391).

Melochia tomentosa L. (Stain-bark). Mt. Vernon, Nassau (121).

Melochia pyramidata L. Grants Town, Nassau (289).

Waltheria americana L. Current Settlement, Eleuthera (337).

HYPERICACEÆ.

Ascyrum hypericoides L. Pine-barrens, New Providence.

BIXACEÆ.

Xylosma ilicifolia Northrop. Low coppice, opposite Spanish Wells, George Island (324).

Xylosma sp. Pine-barrens, Which Point, Abaco (562).

CANELLACEÆ.

Canella winteriana (L.) Gaertn. (Wild Cinnamon, Bahama Whitewood bark). East road, Nassau; Port Nelson, Rum Cay (124, 447).

TURNERACEÆ.

Turnera ulmifolia L. Blue Hills road, and East road, New Providence (11, 132, 269). A weed near settlements on all of the islands visited.

PASSIFLORACEÆ.

**Passiflora rubra* L. Grants Town, Nassau (274).

Passiflora pectinata Griseb. Killarney pine-barrens, New Providence (70).

Passiflora minima L. In a cleared coppice, Mangrove Cay, Andros (228).

Passiflora fœtida L. Grants Town, Nassau; Green Cay (282, 242). On Green Cay a stout specimen about two feet high was found growing quite upright on the sandy shore.

CACTACEÆ.

Opuntia tuna Mill. Governors Harbor, Eleuthera; Port Nelson, Rum Cay (392, 457); Spanish Wells, Georges Island; Watlings Island.

**Opuntia triacantha* DC. (Dildo). Port Nelson, Rum Cay (438).

Pilocereus lanuginosa Rumpl. Current Settlement, Eleuthera (354); Watlings Island; Long Island.

RHIZOPHORACEÆ.

Rhizophora mangle L. (Mangrove). Common along protected salt water in all the islands.

MYRTACEÆ.

**Eugenia confusa* DC. (Stopper). East road, Nassau (144); Current Settlement, Gregory Town, Tarpum Bay and Powells Point, Eleuthera; Mangrove Cay; Cat Island; Long Island; Rum Cay.

Eugenia longipes Berg. Killarney pine-barrens, New Providence; low coppice, near shore Powells Point, Eleuthera (187, 418). Specimens at Powells Point had branches descending three or four feet and then running closely pressed to the sand.

Eugenia axillaris (Sw.) Willd. Mangrove Cay, Andros; Eleuthera, opposite Spanish Wells (216, 322); Gregory Town, Eleuthera.

**Eugenia punctata* Vahl. Tarpum Bay, Eleuthera (406).

Eugenia buxifolia (Sw.) Willd. Powells Point, Eleuthera; Watlings Island (417, 462); Rum Cay; Long Island; Abaco.

Chytraculia pallens (Griseb.) Britton (Spice-wood). Low coppice, Watlings Island (466).

COMBRETACEÆ.

Laguncularia racemosa (L.) Gaertn. (White Mangrove). New Providence (78).

Conocarpus erecta L. (Button-wood). In saline soil on all the islands visited.

Conocarpus erecta sericea Fors. (Button-wood). A white-leaved form of the above, and growing with it on all the islands visited.

MELASTOMACEÆ.

Tetrazygia bicolor (Mill.) Cogn. (Wild Guava). East road, Nassau (139). New Providence; Watlings Island; Long Island; Abaco.

SAMYDACEÆ.

Banara reticulata Griseb. Pine-barrens, New Providence; Governors Harbor, Eleuthera (186, 544, 390).

** Zuelania lactioides* Rich. Killarney barrens, New Providence (97); also on Blue Hills road.

UMBELLIFERÆ.

Centella repanda (Pers.) Small. On edge of a fresh bay, West road, Nassau (177); Cat Island, Watlings Island.

**Fœniculum fœniculum* (L.) Karst. (Fennel). Grants Town, Nassau (284). Naturalized from Europe.

MYRSINIACEÆ.

Rapania guyanensis Aubl. (Beef-wood). Killarney barrens and Soldiers road, New Providence (60, 533). Long Island; Abaco.

Jacquinia keyensis Mez. (Joe-bush). Edge of brackish pond, Blue Hills road, New Providence; Green Cay; Eleuthera, opposite Spanish Wells (6, 236, 334); Gregory Town and Powells Point, Eleuthera; Rum Cay; Long Island; Abaco.

Icacorea paniculata (Nutt.) Sudw. High coppice, Blue Hills road, New Providence (299, 532).

SAPOTACEÆ.

Mimusops sieberi A. DC. (Wild Sapodilla). Brackish flats near Nassau (13); Rum Cay; Watlings Island; Green Cay.

Bumelia microphylla Griseb. (Ink-berry). Brackish flats, New Providence; Little Mangrove Cay, Andros (16, 58, 202); also on the other islands visited.

**Bumelia loranthifolia* (Pierre) Britton (Milk Plum, Saffron). Killarney barrens and East road, New Providence; Spanish Wells, George Island (20, 156, 315); Gregory Town and Governors Harbor, Eleuthera; Cat Island; Rum Cay; Mangrove Cay; Long Island, Abaco. This is given in Northrop as *B. cubensis* Griseb.

Dipholis salicifolia (L.) A. DC. (Wild Cassada, Bustic). East road, Nassau; Green Cay; Tarpum Bay, Eleuthera (140, 257, 395); Powells Point, Eleuthera.

Chrysophyllum sp. West road, Nassau (180).

Sideroxylon mastichodendron Jacq. (Mastic). Eleuthera, opposite Spanish Wells (325); West road, New Providence; Current Settlement, Tarpum Bay, and Powell's Point, Eleuthera.

**Lucuma multiflora* A. DC. (Mammee Sapota, Wild Mammee). East road, Nassau (158). Also in high coppice, Blue Hills road, New Providence.

EBENACEÆ.

Macreightia caribæa A. DC. (Cannabis-bark). Low coppice on East road, Nassau (150).

OLEACEÆ.

**Adelia segregata* (Jacq.) Small. In sandy soil, Spanish Wells, George Island (310).

**Ximenia americana* L. Prostrate on the exposed beach, Rum Cay (451).

LOGANIACEÆ.

Cynoctonum mitreola (L.) Britton. Wet places, West road, Nassau (175).

Spigelia anthelmia L. By fresh marsh, Arthurs Town, Cat Island (429).

GENTIANACEÆ.

Eustoma exaltatum (L.) Griseb. Beach near Nassau; Arthurs Town, Cat Island (35, 422); Rum Cay.

Sabbatia campanulata (L.) Torr. Marshy soil, Lake Killarney, New Providence; Arthurs Town, Cat Island (74, 432).

APOCYNACEÆ.

Vallesia glabra Cav. Gregory Town and Tarpum Bay, Eleuthera (361).

Rhabdadenia sagræi (A. DC.) Small (*Echites sagræi* A. DC.). Pine-barrens, New Providence; Tarpum Bay, Eleuthera (75, 302, 394); all points on Eleuthera; Watlings Island.

Rhabdadenia biflora (Jacq.) Mill. (*Echites biflora* Jacq.). Edge of conocarpus marsh, west of Nassau (79); Mangrove Cay; Gregory Town and Governors Harbor, Eleuthera; Rum Cay; Watlings Island; Abaco.

Urechites andrewsii (Chapm.) Small (*Echites andrewsii* Chapm.). West road, Nassau (81).

Echites umbellata Jacq. Soldiers road, Nassau (253); Tarpum Bay, Eleuthera; Rum Cay; Watlings Island.

Ammocallis rosea (L.) Small (*Vinca rosea* L.). Soldiers road, New Providence (255); in sand near shore, Tarpum Bay, Eleuthera. Also cultivated.

Plumiera obtusa L. (Frangipani). West road, Nassau; Mangrove Cay, Andros; Powells Point, Eleuthera; Rum Cay.

ASCLEPIADACEÆ.

Asclepias curassavica L. Nassau (125, 272).

Metastelma palustre (Pursh.) Schltr. Green Cay; Governors Harbor, Eleuthera (237, 384).

**Metastelma brachystephanum* Griseb. (?). Water Cay, Long Island (525).

CONVOLVULACEÆ.

Ipomœa dissecta Pursh. (*I. sinuata* Ort.). Nassau; Arthurs Town, Cat Island (2, 426).

**Ipomœa sagittata* Cav. (*I. speciosa* Walt.). Border of a fresh marsh on South side, New Providence (549).

Ipomœa pes-capræ L. (Bay Hop.) Beach near Nassau (105). Watlings Island.

Jacquemontia jamaicensis (Jacq.) Hall. West road, Nassau (103).

Evolvulus arbusculus Poir. On sand near beach, Current Settlement, Eleuthera (336); Cat Island; Rum Cay; Tarpum Bay, Eleuthera.

Evolvulus sericeus Sw. Pine-barrens, New Providence (544).

Calonyction bona-nox (L.) Boj. (*Ipomœa bona-nox* L.) (Moonflower). Rum Cay, among Mangroves (445). Naturalized from India.

BORAGINACEÆ.

Heliotropium curassavicum L. Beach near Nassau (36).

Duranta repens L. (Bitter-sweet). Low coppice, New Providence (61); Mangrove Cay, Andros; Abaco.

Cordia sebestena L. West road, Nassau; Little Mangrove Cay, Andros (62, 195).

Cordia bahamensis Urban. (Granny-bush). Near north shore, New Providence (77, 106); Cat Island; Long Island; Abaco. This is given in Northrop as *C. lima* R. & S.

* *Cordia cylindrostachya* R. & S. Gregory Town, Eleuthera; Clarence Harbor, Long Island (378, 496).

Cordia globosa (L.) H. B. K. Clarence Harbor, Long Island (501).

Cordia sp. Rum Cay (443). A weed along shore.

Bourreria havanensis (Willd.) Miers. (Strong-back). Mangrove Cay, Andros; Soldiers road, New Providence (208, 213, 258). Common on all the islands visited.

Bourreria thymifolia Griseb. On sand near the shore, Rum Cay (443).
Tournefortia gnaphaloides (Jacq.) R. Br. On sandy shores of all the islands visited.
Heliotropium parviflorum L. Nassau (129, 271). A common weed.

VERBENACEÆ.

Lantana involucrata L. Killarney barrens, New Providence. In sand near shore, Tarpum Bay, Eleuthera (21, 410). Spanish Wells, George Island; Gregory Town, Eleuthera; Rum Cay; Cat Island; Watlings Island; Long Island; Abaco.
Lantana crocea Jacq. Near Mt. Vernon, Nassau; Clarence Harbor, Long Island (126, 513); common in Eleuthera; Rum Cay; Watlings Island.
Lippia canescens Kunth. Beach near Nassau (98).
**Lippia stœchadifolia* Kunth. By a fresh marsh, Arthurs Town, Cat Island (430).
Lippia nodiflora (L.) Michx. Grants Town, Nassau (280).
Valerianodes jamaicensis (L.) Kuntze. (*Abena jamaicensis* (L.) A. S. Hitch.). On the beach, Nassau (113); Mangrove Cay; Cat Island; Rum Cay; Watlings Island.
Petetia poppigii Schau. Pine-barrens, New Providence; Mangrove Cay, Andros; Arthurs Town, Cat Island (162, 224, 423, 556); Watlings Island.
**Citharexylum quadrangulare* Jacq. High coppice, Mangrove Cay, Andros; along shore, Watlings Island; Clarence Harbor, Long Island (226, 488, 514).
Priva lappulacea (L.) Pers. Grants Town, Nassau (268).
Avicennia nitida Jacq. (Black Mangrove). In salt marshes on most of the islands.
Duranta repens L. (Bitter-sweet). Common in low coppice, New Providence; Mangrove Cay; Abaco.

LABIATÆ.

**Salvia micrantha* Vahl. East road, Nassau; Mangrove Cay, Andros; Gregory Town, Eleuthera (155, 205, 376).
Leonurus sibiricus L. Grants Town, Nassau (283).
Leonotis nepetifolia (L.) R. Br. Grants Town, Nassau (287).
**Scutellaria longiflora* Small. Along road, Governors Harbor, Eleuthera (388). A new species just described from south Florida by Dr. J. K. Small.
Teucrium cubense L. Tarpum Bay, Eleuthera (398).

SOLANACEÆ.

Solanum bahamense L. Mt. Vernon and West road, Nassau; near shore, Rum Cay (119, 171, 441); Mangrove Cay, Andros; Tarpum Bay, Eleuthera; Cat Island; Watlings Island; Long Island.
Solanum nigrum L. Near shore, Mangrove Cay, Andros (229).
Solanum aculeatissimum Jacq. Grants Town, Nassau (276).
**Solanum havanense* Jacq. (Old-man's plum, Devil's plum). Sandy soil, Spanish Wells, George Island (317). Berry said to be poisonous.
Solanum verbascifolium L. Tarpum Bay, Eleuthera (393). New Providence, Mangrove Cay; Rum Cay; Watlings Island.
**Datura arborea* L. Grants Town, Nassau (277).
Capsicum baccatum L. Governors Harbor, Eleuthera (382).

SCROPHULARIACEÆ.

Capraria biflora L. West road, Nassau; Gregory Town, Eleuthera (82, 375).
Maurandia antirrhiniflora (Pers.) Willd. (Wild Yam). East road, Nassau (146).
Stemodia maritima L. Brackish bays, West road, Nassau (191).

Gerardia maritima Raf. Edge of brackish pond, Nassau; Which Point, Abaco (300, 565).

Gerardia domingensis Spreng. Spanish Wells, George Island (355).

Russellia juncea Zucc. In a graveyard, Spanish Wells, Eleuthera (308). Introduced, but now thoroughly established.

Monniera monniera (L.) Britton. Borders of a fresh marsh near shore, Watlings Island (461).

Buchnera elongata Sw. Pine-barrens, New Providence (543).

LENTIBULACEÆ.

Utricularia sp. Fresh-water pool, Arthurs Town, Cat Island (436).

BIGNONIACEÆ.

Tecoma bahamensis Northrop. Nassau (110). Mangrove Cay, Andros; Clarence Harbor, Long Island; Gregory Town and Tarpum Bay, Eleuthera; Cat Island; Watlings Island; Abaco.

Stenolobium stans (L.) G. Don. (*Tecoma stans* (L.) Juss.) (Yellow Elder). Nassau (295); Current Settlement, Eleuthera.

ACANTHACEÆ.

Diapedium assurgens (L.) Kuntz. Rock quarry, Nassau; Water Cay, Long Island (273, 523).

Anthacanthus acicularis (Sw.) Nees. Gregory Town, Eleuthera (377); Watlings Island; Abaco.

RUBIACEÆ.

Philanthus myrtilloides Griseb. (Boar Black-torch). Low coppice, Watlings Island (469).

Antirrhœa lucida (Sw.) Hook. Clarence Harbor, Long Island (517).

Antirrhœa myrtifolia (Griseb.) Urban. Near the beach, Green Cay (246).

Langeria densiflora (Griseb.) B. & H. High coppice, Blue Hills road, New Providence (551).

Chiococca parvifolia Willd. Low coppice, Soldiers road, New Providence (557).

Chiococca pinetorum Britton. Killarney pine-barrens, and low places on North shore, New Providence (18, 80, 163, 185).

Chiococca racemosa L. Gregory Town, Eleuthera (363).

**Galium hispidulum* Mich. In pine-barrens, Which Point, Abaco (563).

Ernodea cokeri Britton (sp. nov.†.). Stems very slender, trailing, finely pubescent, 3 cm. long or longer, much branched. Leaves narrowly linear, 2-3 cm. long, 1-1.5 mm. wide, rough-pubescent, very acute, 1-nerved, narrowed at the base into very short petioles; stipules about 2 mm. long; fruit somewhat obovate, sessile, about 4 mm. long, crowned with the 5 subulate calyx-lobes, which are 6 or 7 mm. in length. Growing under *Pteridium caudatum* (E.) Kuhn in pine-barrens, Which Point, Abaco (564). W. C. Coker, July 20, 1903.

Ernodea littoralis L. Killarney pine-barrens, New Providence; near beach, Green Cay (63, 244). Common on the shores of all the islands. The Green Cay plants had white flowers.

Rachicallis maritima (Jacq.) Schum. On rocks along shore, West road, New Providence (19); common in like situations on all the islands visited.

FIG. 1.—VEGETATION ON BORDER OF SALT PAN, RUM CAY

FIG. 2.—VEGETATION IN MEADOW, WATER CAY, LONG ISLAND

VIEWS ILLUSTRATING VEGETATION

Psychotria undata Jacq. Mt. Vernon, New Providence; Eleuthera, opposite Spanish Wells; in a banana hole, Tarpum Bay, Eleuthera; Clarence Harbor, Long Island (28, 330, 412, 507).

Strumpfia maritima Jacq. Killarney pine-barrens, New Providence (59); common near the shores of all the islands visited.

Hamelia patens Jacq. Bluebeard's Tower, Nassau (127).

Scolosanthus bahamensis Britton. Low coppice, East road, Nassau (138).

Erithalis fruticosa L. (Black-torch). Low coppice, New Providence; on sandy beach, Watlings Island (43, 73, 161, 192, 463); common on all the islands visited. The Watlings Island specimen is a peculiar beach form with thick, round leaves and procumbent, trailing branches.

Catesbæa fasciculata Northrop. Near the beach, Green Cay (247).

Catesbæa spinosa L. (Prickly Apple). Side of hill, Gregory Town, Eleuthera (367); abundant on Long Island.

Guttarda scabra Lam. Low coppice, Eleuthera, opposite Spanish Wells (318); not uncommon in pine-barrens on New Providence.

Guttarda elliptica Sw. Arthurs Town, Cat Island; Clarence Harbor, Long Island (425, 515).

Randia aculeata L. Pine-barrens, Soldiers road, Nassau (56).

Morinda roioc L. Gregory Town, Eleuthera (379). Which Point, Abaco.

Exostemma caribæum (Jacq.) R. & S. (Prince-wood). Watlings Island (465). New Providence.

Genipa clusiæfolia (Jacq.) Griseb. (Seven-year-apple). New Providence; Rum Cay; Green Cay; Current Settlement, Eleuthera; Watlings Island; Long Island; Abaco.

Cucurbitaceæ.

Anguria keithii Northrop. Mangrove Cay, Andros (204, 218).

Goodeniaceæ.

Scævola plumieri (L.) Vahl. A common beach plant on all the islands visited.

Compositæ.

Aster tennuifolius L. Edge of a brackish pond, Nassau (3b); Abaco.

Borrichia sp. Edge of a brackish pond, Nassau (14).

Borrichia argentea DC. Common on shores of all the islands visited.

Borrichia glabra Small. Common with above on all the islands visited.

Iva cheiranthifolia Kunth. Blue Hills road, New Providence; Green Cay (12, 239).

Iva imbricata Walt. On sandy shores, Green Cay; Current Town, Eleuthera; Watlings Island; Governors Harbor, Eleuthera; Rum Cay; New Providence.

Baccharis dioica Vahl. Killarney barrens, New Providence (183); along shore, and in moist places, Mangrove Cay, Andros; Gregory Town and Powells Point, Eleuthera; Cat Island; Rum Cay; Watlings Island.

**Baccharis angustifolia* Michx. (Broom-bush). Edge of Mangrove Swamp, West road, Nassau (194).

**Leptilon canadense* (L.) Britton. Governors Harbor, Eleuthera; Rum Cay (381, 455).

Ageratum muticum Griseb. Arthurs Town, Cat Island (431).

Isocarpha oppositifolia (L.) R. Br. Clarence Harbor, Long Island (492).

Melanthera deltoidea Michx. Clarence Harbor, Long Island (500).

Eupatorium repandum Willd. Water Cay, Clarence Harbor (526); growing with *Salmea*.

Eupatorium sp. Which Point, Abaco (560).

Bidens leucantha Willd. Nassau (22); New Providence; Mangrove Cay, Andros; Abaco.
Salmea petrobioides Griseb. Beach near Nassau (25); common on shores of all the islands visited.
Stemmodontia trilobata (L.) Cass. West road, Nassau (26).
Vernonia bahamensis Griseb. Pine-barrens, New Providence (53); Abaco.
Eupatorium ageratifolium DC. West road, Nassau (100).
Tridax procumbens L. Beach near Nassau (104).
Parthenium hysterophorus L. West road, Nassau (107).
Melanthera nivea (L.) Small. Fort Montague, Nassau; Little Mangrove Cay, Andros (134, 198).
Emilia sonchifolia (L.) DC. Bluebeard's tower, Nassau (135).
Anastraphia northropiana Greenm. (Brass-wood). East road, Nassau (151).
Willughbæya heterophylla Small. Damp pine-barrens, New Providence (164, 545); Abaco. Listed by Northrop as *W. scandens*, but the Bahama plant has now been given specific rank by Small. It is identical with the south Florida form.
Pluchea purpurascens Sw. Marshy places, West road, Nassau (173).
Pluchea fœtida (L.) B. S. P. West road, Nassau (174, 356).
Pluchea odorata (L.) Cass. (Sour-bush). West road, Nassau (27); Mangrove Cay; Watlings Island; Long Island.
Ambrosia artemisiæfolia L. Grants Town, Nassau (291).
Ambrosia hispida Pursh. Nassau (34); common on sandy shores on all the islands visited.

The plants that are given in the preceding lists may be summarized as follows:

Myxomycetes	11
Fungi	22
Lichens	40
Algæ [27]	59
Liverworts	8
Mosses	3
Total number of lower plants	143
Ferns	14
Flowering plants	423
Total number of plants listed	580
Of these there are—	
Unidentified species of flowering plants	10
Unidentified species of lower plants	6
Plants identified but not collected	37

Three new species are here first described; they are *Pithecolobium mucronatum* Britton, *Malvaviscus cokeri* Britton, and *Ernodea cokeri* Britton. In addition to these, two new species from our collection have already been described. These are *Neomeris cokeri* Howe, an alga, and *Torrubia cokeri* Britton, a flowering plant. Three other new species first collected by us, but pub-

[27] This does not include five species of Algæ collected in the Atlantic Ocean and therefore not properly listed among the Bahama plants.

lished from type specimens collected later by Dr. Britton, Dr. J. K. Small and Dr. Millspaugh, are *Savia bahamensis* Britton, *Scutellaria longiflora* Small, and *Euphorbia cayensis* Millsp.

Of identified species all of the Myxomycetes, 15 of the Fungi, 38 of the Lichens, all of the Liverworts, 1 of the Mosses and most of the Algæ had not before been collected from the Bahamas.

Specimens of wood, now at the University of North Carolina, were collected from the following 40 trees:

From Clarence Harbor, Long Island:

Tetrazygia bicolor (Mill.) Cogn.
Cæsalpinia vesicaria L.
Tecoma bahamensis Northrop.
Fagara flava (Vahl.) Kr. & Urb.
Reynosia septentrionalis Urban.
Erythroxylon obovatum MacF.
Erythroxylon brevipes DC.
Lysiloma bahamensis Benth.
Krugiodendron ferreum (Vahl.) Urban.
Guaiacum sanctum L.
Amyris elemifera L.
Gymnanthes lucida Sw.
Rapanea guyanensis Aubl.
Maytenus buxifolia (Rich.) Griseb.
Hypelate trifoliata Sw.
Exostemma caribæum (Jacq.) R. & S.
Torrubia longifolia (Heimerl) Britton.
Bursera simaruba (L.) Sarg.
Coccolobis diversifolia Jacq.
Coccolobis uvifera (L.) Jacq.
Bourreria havanensis (L.) Miers.
Pithecolobium keyense Britton.
Eugenia confusa DC.
Fagara fagara (L.) Small.
Colubrina colubrina (L.) Millsp.
Colubrina reclinata (L'Her.) Brog.
Mimusops sieberi A. DC.
Conocarpus erecta sericea Fors.

From New Providence:

Ilex krugiana Loes.
Ilex repanda Griseb.
Swietenia mahogani L.
Pera bumeliaefolia Griseb.
Icacoria paniculata (Nutt.) Sudw.
Exothea paniculata (Juss.) Radlk.
Simaruba glauca Kth.
Lysiloma paucifoliola (DC.) A. S. Hitch.
Metopium metopium (L.) Small.

From Abaco:

Juniperus barbadensis L.
Sideroxylon masticodendron Jacq.

From Watlings Island:

Casuarina equisetifolia Forst.

EXPLANATION OF PLATES.

Plate I.

Bougainvillea in a Nassau Garden.

Plate XXXIII.

Fig. 1. A lawn in Nassau, with Tamarind tree (*Tamarindus indica*) in center.
Fig. 2. Pawpaw tree (*Carica papaya*) in fruit. In a door-yard, Nassau.

Plate XXXIV.

Fig. 1. A beach scene in Nassau, showing in center an "Almond" tree (*Terminalia catappa*) with upright shoots from a prostrate trunk.
Fig. 2. Fig tree (*Ficus sapotifolia*) supported by large aerial roots: "Thomson's Folly," Nassau.

Plate XXXV.

Fig. 1. A Nassau scene, showing the Royal Palm (*Roystonia regia*) in center.
Fig. 2. A Pine tree (*Pinus bahamensis*), about 55 feet high, surrounded by Silver Palm (*Thrinax bahamensis*): Blue Hill road, New Providence.

Plate XXXVI.

Fig. 1. Lignum Vitæ trees (*Guaiacum sanctum*) on a hill near Clarence Harbor, Long Island; showing the effect of prevailing winds.
Fig. 2. Sand-box tree (*Hura crepitans*) in a Nassau street.

FIG. 1.—VEGETATION ON SANDY BEACH, NEW PROVIDENCE

FIG. 2.—VEGETATION ON SANDY BEACH, GREEN CAY

VIEWS ILLUSTRATING VEGETATION

PLATE XXXVII.

FIG. 1. Scene in a fresh-water marsh on the north side of New Providence to the west of Nassau, with Thatch Palm (*Inodes palmetto*) in center: Wax Myrtle (*Myrica cerifera*), Custard Apple (*Anona palustris*) and Cocoa Plum (*Chrysobalanus icaco*) in the undergrowth: (*Salmea petrobioides*) in patches on the hillside in foreground.

FIG. 2. Forest scene on Which Point, Abaco, showing Pines with "May-pole" fern (*Pteridium caudatum*) beneath.

PLATE XXXVIII.

FIG. 1. A typical high coppice at junction of Blue Hill and Soldiers roads, New Providence.

FIG. 2. Mixed growth of Pines, Silver Palms (*Thrinax bahamensis*) and deciduous trees on Blue Hill road, New Providence.

PLATE XXXIX.

FIG. 1. Logwood tree (*Hæmatoxylon campechianum*) in a clearing at Current Settlement, Eleuthera.

FIG. 2. Fig trees in a clearing on Mangrove Cay, Andros. *Ficus jacquinifolia* in center, *Ficus sapotifolia* to left. Small aerial roots are running down the stems.

PLATE XL.

FIG. 1. "Bamboo tree" (*Agave rigida*) on a barren hillside: east shore, Gregory Town, Eleuthera. The flower stalk is about 30 feet high and 13 inches in diameter.

FIG. 2. An epiphytic plant (*Tillandsia recurvata*) on (*Strumpfia maritima*) in an open brackish flat near Nassau.

PLATE XLI.

FIG. 1. Pigeon Plum tree (*Coccolobis laurifolia*); Clarence Harbor, Long Island.

FIG. 2. Mangrove trees (*Rhizophora mangle*), about 35 feet high, on a small cay in the lake, Watlings Island.

PLATE XLII.

FIG. 1. Rock coast on the north side of New Providence, west of Nassau, showing, in almost pure association, *Rhacicallis maritima* to right and *Suriana maritima* to left.

FIG. 2. Sandy shore on north side of New Providence, west of Nassau: *Tournefortia gnaphalodes* and *Uniola paniculata* in foreground; behind these a fringe of Sea grape (*Coccolobis uvifera*); with Cocoanut Palm (*Cocos nucifera*) in background.

PLATE XLIII.

FIG. 1. Sandy and rocky shore on the west side of Watlings Island: Thatch Palms in background; Cocoa Plum (*Chrysobalanus icaco*) next; then an open growth of *Ambrosia hispida* and *Distichlis maritima;* and finally *Suriana maritima* on the rocky ledge at high-tide mark.

FIG. 2. Scene on a rocky beach, west side of Watlings Island; showing Thatch Palms (*Inodes palmetto*) in background and "Spanish Cedar" (*Casuarina equisetifolia*) to left. In foreground are natives washing clothes.

Plate XLIV.

Fig. 1. *Tournefortia gnaphalodes* on a sandy beach at Mangrove Cay, Andros. Many of the branches have recurved and taken root at their tips, forming new plants.

Fig. 2. Outer limit of vegetation on a rocky coast, Water Cay, Long Island. In foreground is *Hymenocallis arenicola* with Silver Palm (*Thrinax bahamensis*) and Strong-back (*Bourreria havanensis*) behind. Between the palms the Strong-back has been worn away by the wind.

Plate XLV.

Fig. 1. *Hymenocallis arenicola* in flower with Thatch Palms (*Inodes palmetto*) in background; western shore of Eleuthera, opposite Current Town. Among the Hymenocallis is scattered *Corchorus hirsutus*.

Fig. 2. Rocky shore on eastern coast of Long Island opposite Clarence Harbor. *Rhacicallis maritima* on rocks in foreground. With it is mixed a little *Iva imbricata*, *Salmea petrobioides*, *Strumpfia maritima*, *Ernodea littoralis*, *Suriana maritima* and *Uniola fasciculata*. On the slope and top of the ridge behind this association is a low rock coppice of Silver Palms (*Thrinax bahamensis*), *Jacquinia keyensis*, *Genipa clusiaefolia*, etc.

Plate XLVI.

Fig. 1. *Avicennia nitida* on the border of a salt pan on Rum Cay: showing the upright aerial roots as tall as the leafy plant.

Fig. 2. A meadow of *Sporobolus virginicus* on Water Cay, Long Island: *Avicennia nitida* (to right) and *Conocarpus erecta* (to left) in background. The small scrubs to left in foreground are *Borrichia arborescens*.

Plate XLVII.

Fig. 1. Sandy beach on south side of New Providence: *Avicennia nitida* in shallow sea water, and the typical beach plants, *Tournefortia gnaphalodes*, *Scaevola plumieri*, *Strumpfia maritima*, and the grasses, *Paspalum vaginatum* and *Sporobolus virginicus*. In background is a fringe of Silver Palms (*Thrinax bahamensis*).

Fig. 2. Sandy beach on Green Cay looking landward. Grasses mixed with *Sesuvium portulacastrum* in foreground with a low coppice behind.

MOSQUITOES OF THE BAHAMA ISLANDS

INTRODUCTION

BY

L. O. HOWARD, Ph. D.,
Chief Entomologist, U. S. Department of Agriculture.

Down to the time when the Geographical Society of Baltimore sent out its Expedition to the Bahamas not a single species of mosquito was known from these Islands, and in fact none have since been recorded; so that the information contained in the following paper by Mr. Coffin is entirely new and might well be expected to afford some facts of interest. In examining his material and in reading the report of his observations, I am at once struck by the fact of the absence of mosquitoes of the genus *Anopheles* or any of the mosquitoes of the tribe *Anophelini*. While this by no means indicates that species of this group do not occur upon the Islands, it is significant and would seem to indicate that, from the standpoint of diseases of malarial origin, the Bahamas must rank as a health resort. With regard to the yellow fever mosquito, *Stegomyia fasciata* (Fabr.), the case is quite different. This species seems to be found in most localities in which Mr. Coffin collected, and therefore quarantine measures against yellow fever on the part of the Islands should be rigorous, and carefully screened detention hospital facilities should be provided for incomers to the Islands from vessels having the fever aboard.

From the point of view of geographic distribution of species, mosquitoes have a smaller faunistic value than certain other groups of insects. Many forms have become widespread through commerce. On large continental areas they are readily carried by railway trains, and to islands it is well known that they are carried long distances upon ships and that in earlier times they were allowed to breed freely in the fresh-water supply of vessels. Therefore it must not be considered remarkable that of the fifteen species collected by Mr. Coffin none of them are distinctively Bahamian. It is rather curious though that without exception all have a North American distribution, although several of them have also a tropical range. Certain forms, like *Culex pipiens* Linné, are cosmopolitan; *Stegomyia fasciata* (Fabr.) is found all through the tropical life zone and in regions which correspond to the Lower Austral in

the United States fauna; *Janthinosoma varipes* (Coq.) has previously been found only in Mexico and in Mississippi; *Culex confirmatus* (Arrib.) is a West Indian form which is also found in the State of Louisiana, probably by accidental commercial introduction; *Culex cyanescens* Coq., has previously been found only in south Texas, and *Culex nanus* Coq., originally described from Cuba, has for its United States locality only Key West, where it is probably also an accidental commercial importation. Other forms have a very wide distribution, certain of them, like *Culex sollicitans* Walk., *C. territans* Walk., and *C. trivittatus* Coq., extending north to New England.

It will thus appear that the report is of very considerable interest, and on behalf of the U. S. National Museum I wish to express to Mr. Coffin and to the Director of the Expedition, hearty thanks for the interesting series of specimens.

The series of early stages of these mosquitoes collected by Mr. Coffin will be used in the preparation of a monograph of the mosquitoes of North and Central America and the West Indies upon which I am now at work, in collaboration with Mr. D. W. Coquillett and Dr. H. G. Dyar, under a grant from the Carnegie Institution.

MOSQUITOES OF THE BAHAMA ISLANDS

BY

T. HOMER COFFIN

INTRODUCTION.

These observations were made during June and July, 1903, while the author was a member of the Bahama Expedition of the Geographical Society of Baltimore. Although they cover a period of only two months, the time chosen was probably as favorable for mosquito collecting as any, since the rainfall was abundant. Many of the islands contain inland marshes of brackish water, and everywhere the weathering of the coral rock, of which the islands are composed, produces pot-holes and shallow depressions which are filled with fresh water during the rainy season. There are few streams of running water, and these are small, draining marshes and low ground.

The natives, who are dependent on rain water for domestic purposes, use tubs, barrels, and cisterns for holding the supply, and all of these receptacles were found to contain vast numbers of mosquito larvæ. In some places the natives have dug down through the coral rock to water, but this well or "spring" water is always more or less brackish to the taste. In order to make the water fit for drinking the natives put it in barrels containing ashes, to soften it, and these barrels were found to contain mosquito larvæ also.

The larvæ, which were collected by means of a small dipper, were placed in small specimen bottles and taken on board the ship, where a temporary laboratory had been fitted up. Here the larvæ were transferred to large breeding jars, and were studied through their life history. Cast skins were either mounted in balsam or preserved in alcohol or formalin.

Adults were caught in test tubes while in the resting position, each specimen being carefully preserved between plugs of cotton wool. Powdered naphthalene in a small insect gun was used to kill and preserve the specimens. The species of mosquitoes found at the different localities are given below:

DESCRIPTION OF STATIONS.

The following is a description of the various stations at which mosquitoes were collected, with a list of the forms taken at each.

Nassau, New Providence.

During the stay at Nassau specimens were obtained from the town and from the woods and thickets in the vicinity. Water barrels, tin cans, and roadside puddles were found full of larvæ, and the adults were often obtained by entering houses and native huts and searching in dark rooms and corners. The following species were taken in the town:

Stegomyia fasciata (Fabr.).
Culex confirmatus (Arrib.).
Culex nanus Coq.
Culex pipiens Linné.
Culex tæniorynchus Wied.
Culex territans Walk.

Specimens from the vicinity of Nassau on the island of New Providence were taken from Fort Charlotte, Mount Vernon, Mammæ Pool, and Farrington road, about three miles from the town. At Fort Charlotte the specimens were taken, both as larvæ and adults, from the rain barrels and darkened rooms of the fort and from the woods just south of the fort. They were:

Stegomyia fasciata (Fabr.).
Janthinosoma varipes (Coq.).
Culex confirmatus (Arrib.).
Culex nanus Coq.
Culex pipiens Linné.
Culex tæniorynchus Wied.

At Mount Vernon the larvæ were obtained from small pot-holes in the rock, and at Mammæ Pool adults were taken flying near the pool, and some larvæ from the water of the pool. They were:

Stegomyia fasciata (Fabr.).
Janthinosoma varipes (Coq.).
Culex confirmatus (Arrib.).
Culex jamaicensis Theob.
Culex nanus Coq.
Culex pipiens Linné
Culex serratus Theob.
Culex tæniorynchus Wied.

From Farrington Road, about three miles from town, larvæ and adults were obtained. These were:

Stegomyia fasciata (Fabr.).
Culex confirmatus (Arrib.).
Culex nanus Coq.
Culex pipiens Linné
Culex serratus Theob.
Culex tæniorynchus Wied.

Andros.

Specimens were obtained here from Mangrove Cay and a small island near Reids Cay in Middle Bight. At Mangrove Cay larvæ were taken from pools in the rock, at some distance from any dwelling, and adults from the thickets some distance inland. The species were:

Stegomyia fasciata (Fabr.).
Culex confirmatus (Arrib.).
Culex jamaicensis Theob.
Culex nanus Coq.
Culex pipiens Linné
Culex sollicitans Walk.
Culex tæniorynchus Wied.

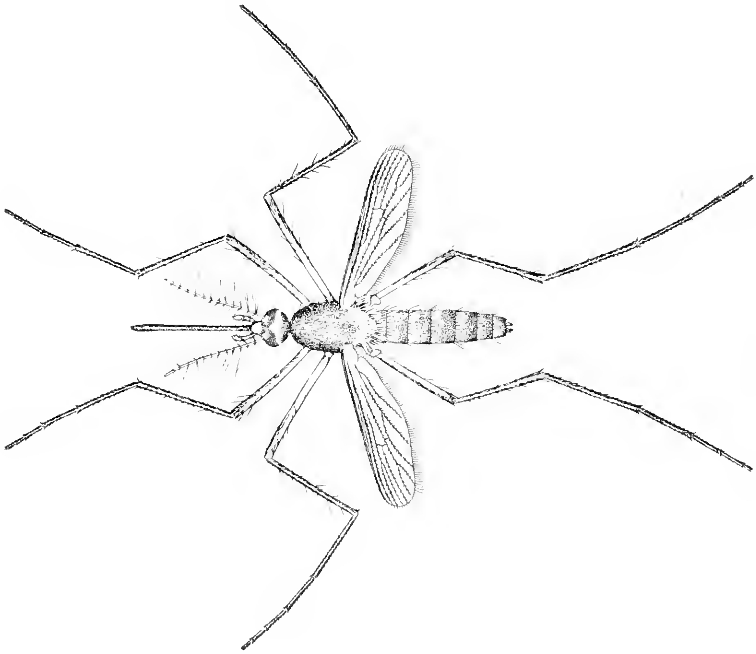

FIG. 2.—WYEOMYIA SMITHII (COQ.)

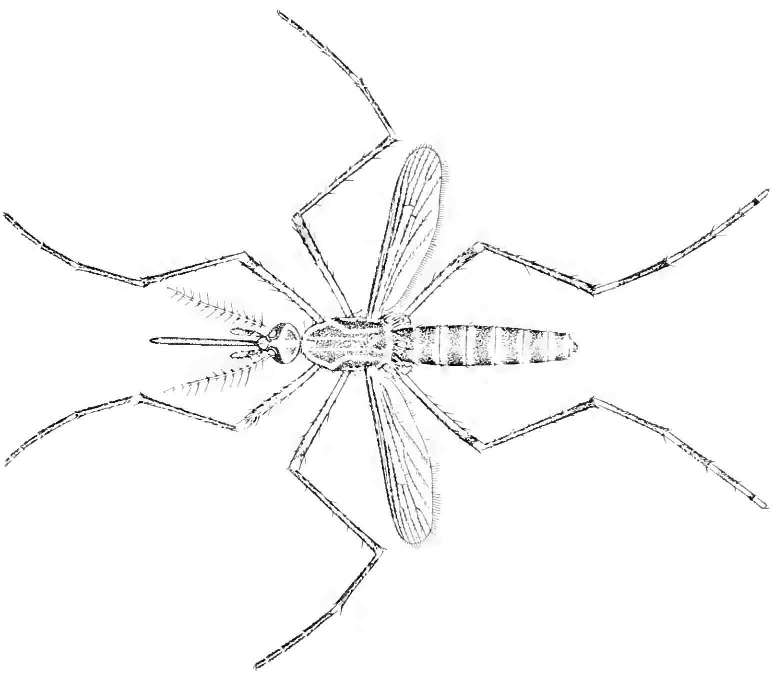

FIG. 1.—STEGOMYIA FASCIATA (FABR.) (YELLOW FEVER MOSQUITO)

BAHAMA MOSQUITOES

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The small island near Reids Cay is about fourteen miles from Mangrove Cay and uninhabited. The following species were obtained here:

Culex confirmatus (Arrib.).
Culex nanus Coq.
Culex sollicitans Walk.
Culex tæniorynchus Wied.

Green Cay.

At this place mosquitoes in innumerable swarms flew out to our vessel while at anchor near the shore, and the next morning specimens were collected on board. The species were:

Culex jamaicensis Theob.
Culex sollicitans Walk.

Spanish Wells, George Island.

All the specimens obtained here were either from houses or water barrels near them. The brackish water which these barrels contained is softened by adding ashes and used for drinking and cooking purposes by the natives. The following species were obtained here:

Stegomyia fasciata (Fabr.).
Culex pipiens Linné

Harbor Island, Eleuthera.

The specimens obtained here were from water barrels, under the same conditions as those from Spanish Wells. They all belonged to the one species, *Stegomyia fasciata* (Fabr.).

Current Settlement, Eleuthera.

These specimens were obtained from houses and water barrels and from a small pool. The houses and water barrels furnished the following species:

Stegomyia fasciata (Fabr.).
Culex confirmatus (Arrib.).
Culex nanus Coq.
Culex pipiens Linné

From the pool were taken:

Janthinosoma varipes (Coq.).
Culex tæniorynchus Wied.

Governors Harbor, Eleuthera.

These specimens were all taken from a marsh near the seashore.

Stegomyia fasciata (Fabr.).
Culex restuans Theob.
Culex tæniorynchus Wied.

Tarpum Bay, Eleuthera.

The following specimens were obtained from this settlement.

Stegomyia fasciata (Fabr.).
Culex pipiens Linné

From the woods inland also:

Wycomyia smithii (Coq.).
Janthinosoma musica (Say.).
Culex confirmatus (Arrib.).
Culex cyanescens Coq.
Culex nanus Coq.
Culex pipiens Linné.
Culex tæniorynchus Wied
Culex trivitattus Coq.

Powells Point, Eleuthera.

These specimens were taken from the thicket near the shore.

Culex confirmatus (Arrib.).
Culex pipiens Linné.
Culex tæniorynchus Wied.

Arthurs Town, Cat Island.

These specimens were all taken from the thicket some distance inland.

Culex nanus Coq.
Culex pipiens Linné.

Port Nelson, Rum Cay.

These were taken about a mile inland.

Culex sollicitans Walk.
Culex tæniorynchus Wied.

Watlings Island.

Specimens were taken here from Cockburn Town and from the United Estate, on the opposite side of the island. At Cockburn Town some larvæ and adults were taken from pools in the rock. From Cockburn Town:

Stegomyia fasciata (Fabr.).
Wyeomyia smithii (Coq.).
Culex confirmatus (Arrib.).
Culex sollicitans Walk.
Culex tæniorynchus Wied.

From United Estate:

Culex confirmatus (Arrib.).
Culex sollicitans Walk.
Culex tæniorynchus Wied.

Clarence Harbor, Long Island.

Specimens were obtained from houses in the settlement and from dense woods inland. From the settlement the following were taken:

Stegomyia fasciata (Fabr.).
Culex confirmatus (Arrib.).

From the woods inland:

Wyeomyia smithii (Coq.).
Culex tæniorynchus Wied.

DESCRIPTIONS OF IMPORTANT MOSQUITOES.

In order to aid local physicians of the Bahama Islands in determining the various mosquitoes in the districts where they practice, descriptions of the

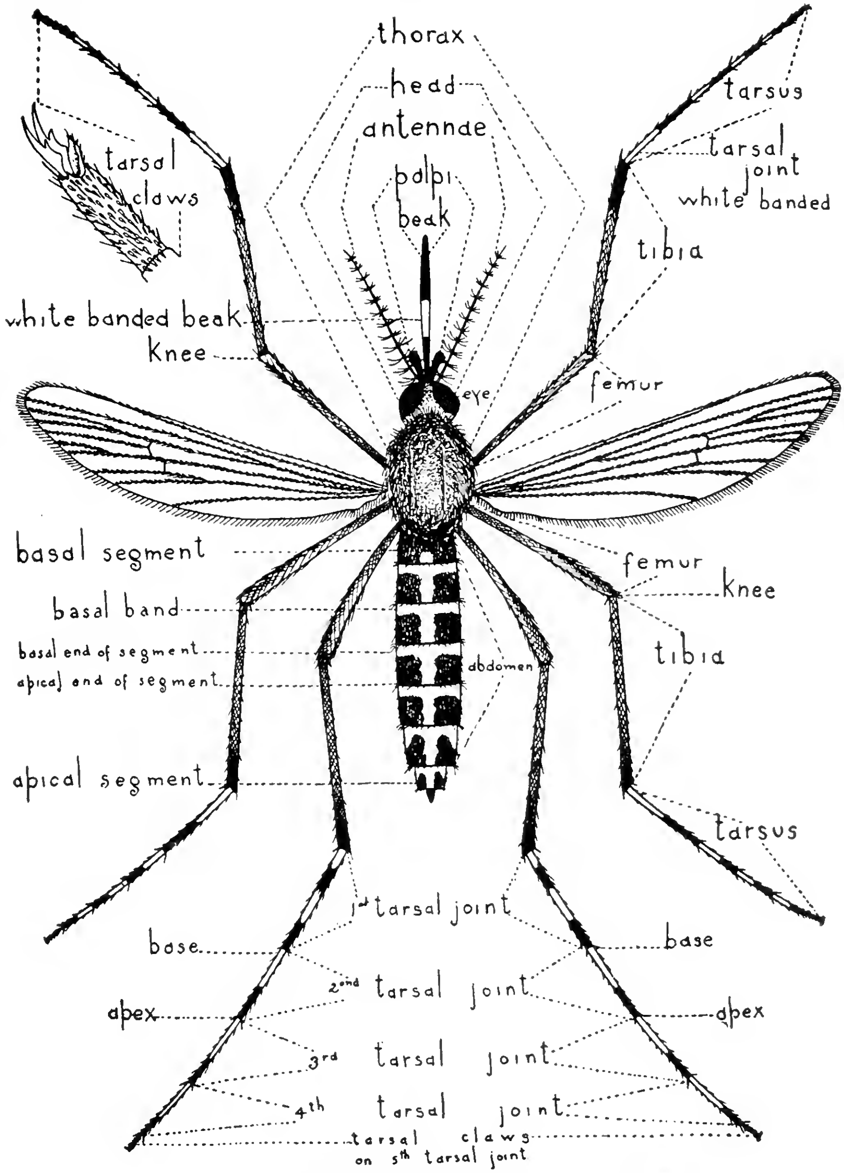

FIG. 7.—DIAGRAM OF MOSQUITO WITH PARTS NAMED.

Published here by courtesy of Dr. J. B. Smith, State Entomologist of New Jersey.

species mentioned above will now be given. In making these descriptions, the author has quoted from Coquillett's various publications, and for other species

has somewhat abbreviated the descriptions given by Theobald in his "Monograph of the Culicidæ." Those who are not familiar with the anatomy of the mosquito will find Fig. 7 of great aid in following the descriptions.

Stegomyia fasciata (Fabr.)

Plate XLVIII, Fig. 1.

Culex fasciata Fabricius, 1805, Syst. Antl., p. 36.

Description. *Color.*—To the naked eye the insect appears black and white, the pure white contrasting strongly with the jet black.

Size.—Ordinary length 3 to 5 mm.

Head.—Densely clothed with broad, flat scales, black and grey on each side, a white patch in the middle in front, a white patch on each side, a thin white border to the eye, forked, upright scales from nape; clypeus is scaly; antennæ blackish, with narrow, pale bands; proboscis black—no white bands.

Thorax.—Dark brown, with reddish-brown, golden and creamy curved scales, ornamented as follows: a pure white, broad, curved band on each side, curved inward about the middle of the mesonotum, and continues back as a thinner pale line to the scutellum; two thin, parallel, pale-scaled lines between, extending about half-way across the mesonotum, and more or less on the scutellum, a short white line in front between these two, a white spot on each side of the thorax in front near the neck; scutellum with a thick row of white, broad, flat scales, and three tufts of bristles; metanotum brown; pleuræ dark-brown, with patches of silvery scales.

Abdomen.—Dark brownish-black, covered in places with black, white and grey scales, with basal band of white scales, first segment with creamy scales, sides with patches of white scales, forming more or less triangular patches.

Legs.—Black, with basal white bands; tibia black; metatarsi with basal white bands; fore tarsi with first joint basally white, the rest black; mid tarsi the same; hind tarsi all basally white except the last joint, which is pure white.

Breeding Places.—Still water, as in rain barrels, water tanks, pools.

Remarks.—136 specimens of this form were taken at the following places: Nassau, June 19, July 2; Current Settlement, July 5; Spanish Wells, July 4; Harbor Island, July 4; Governors Harbor, July 7; Tarpum Bay, July 7; Watlings Island, July 13; Long Island, July 15.

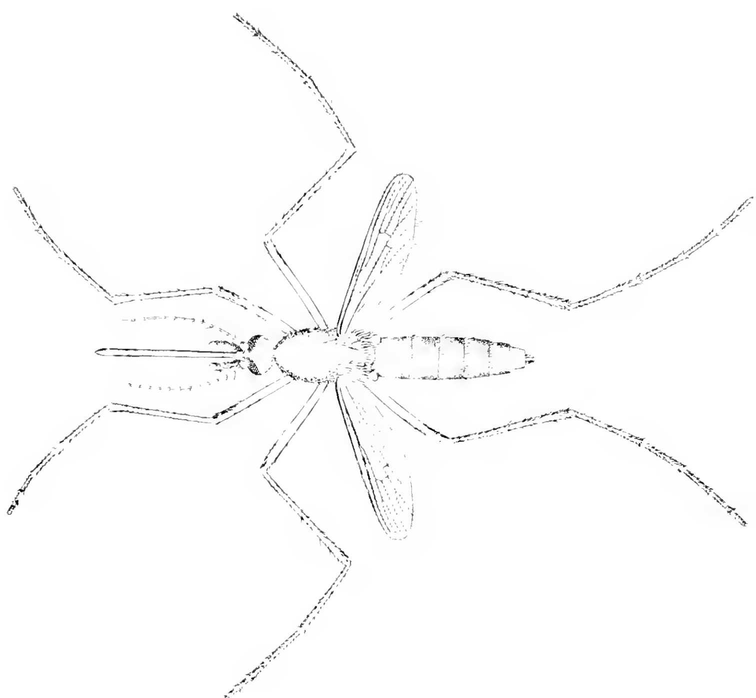

Fig. 1.—Culex confirmatus (Arrib.)

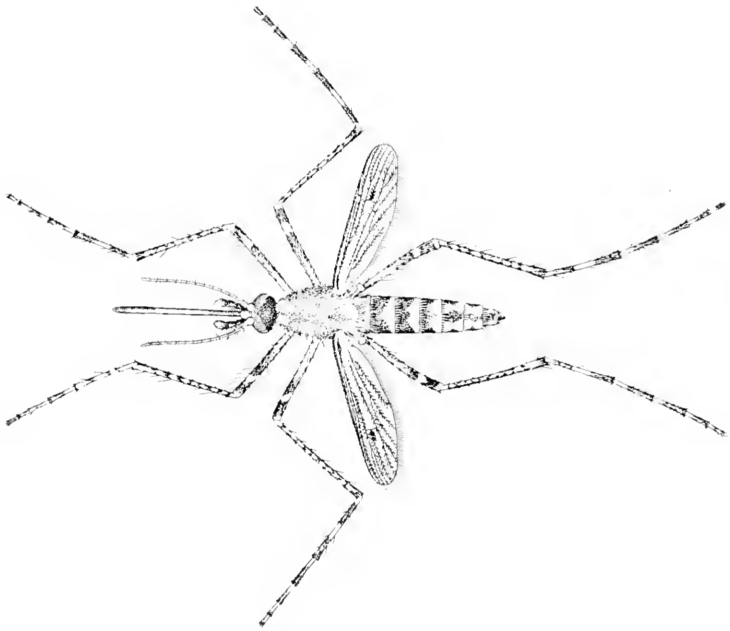

Fig. 2.—Culex jamaicensis Theob.

BAHAMA MOSQUITOES

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Janthinosoma musica (Say).

Culex musicus Say, 1829, Jour. Acad. Nat. Sci. Phil., vol. vi, p. 149.

Description. *Color.*—Light yellow.

Size.—4.8 to 5 mm.

Head.—Honey yellow, covered with orange-brown scales, and a few yellow hairs projecting on front; eyes black, with coppery reflections; antennæ dark-brown; palpi dark-brown, or brilliant violet or purple in some lights; proboscis dark-brown, covered with scales and with metallic purple reflections.

Thorax.—Deep metallic brown with purplish reflections, with scattered yellow and orange, flat, spindle-shaped scales, dark bristles; scutellum ochraceous brown, dark-brown in the middle and sides; mesonotum shiny chestnut-brown; pleuræ brown, with large patches of creamy white scales.

Abdomen.—Deep purplish-brown above when viewed pointing from the light; when pointing to the light very brilliant metallic violet and purple; laterally are patches of yellow scales, especially on the last four segments; a triangular patch of yellow scales on each segment; the first segment is entirely yellow, scaled beneath.

Legs.—Metallic blue and purple, in some lights almost brown; the last two tarsi of the hind legs and apex of second pure white; ungues nearly the same size, but slightly different form, a tooth present on each.

Wings.—Brownish tinge and brown scales, first submarginal cell slightly longer and narrower than second posterior cell; branches curved, stem about one-half less than its length.

Remarks.—13 specimens of this form were taken at Tarpum Bay, July 7.

Janthinosoma varipes (Coq.).

Conchyliastes varipes Coquillett, 1904, Can. Ent., vol. xxxvi, p. 10.

Description.—"Black; the front and hind femora, except their broad apices, the posterior side of the middle femora except their apices, and the stems of the halteres, yellow, the fourth joint of the hind tarsi white; scales of palpi violaceous, those of the occiput yellowish-white and with a patch of violaceous ones on either side; (mesonotum abraded; what scales remain are yellowish-white and a few black ones along the middle); scales of abdomen violet blue, those on sides of first two segments, hind angles of the others except the last one, under surface of each segment except the last one and base of the preceding,

whitish; scales on yellow portion of femora yellowish white, those on the remainder and on tibiæ violet blue, those on the tarsi black except on the front joint of the hind tarsi, where they are white; claws of front tarsi toothed; wings grayish hyaline, veins and scales brown, petiole of first submarginal cell from two-fifths to three-fifths as long as that cell, hind cross-vein less than its length from the small; length 4 mm."

Remarks.—12 specimens of this form were taken at Nassau, June 22, and Current Settlement, July 5.

Wyeomyia smithii (Coq.).

Plate XLVIII, Fig. 2.

Aëdes smithii Coquillett, 1901, Can. Ent., vol. xxxiii, p. 260.

Description.—"Black; the pleuræ largely, venter, bases of halteres, coxæ and bases of femora, yellow; scales of upper side of body dark-brown, some on the abdomen having a violaceous reflection; scales of femora black, those on the under side light yellow; scales of hind tibiæ black, those on the inner side and on the front and middle tibiæ, and their tarsi, light yellow; tarsal claws simple; wings hyaline, first submarginal cell nearly twice as long as its petiole; length, 3 mm."

Remarks.—12 specimens of this form were taken at the following places: Tarpum Bay, July 7; Long Island, July 15.

Culex confirmatus (Arrib.).

Plate XLIX, Fig. 1.

Ochlerotatus confirmatus Arribálzoga, 1891, Rev. d. Mus. La Plata, vol. i, p. 46.

Description. *Color.*—Dark brown; thorax silvery white.

Size.—Ordinary; length 4.5 to 5 mm.

Head.—Dark brown, clothed with pale creamy scales in the middle, ochraceous ones at the side and behind, and with upright, ochraceous, forked ones; sides with flat scales; eyes deep, purplish-black and silver; clypeus deep purplish-brown; antennæ dark brown; palpi black scaled, proboscis covered with shiny black scales.

Thorax.—Clothed in front with pale, silky, yellowish, narrow, curved scales, which gradually become pure silky-white about half way across the mesonotum, the remaining parts of the mesonotum darker, covered with scat-

tered brown scales, as also are the sides; scutellum brownish, with creamy scales, and a border of golden-brown bristles; pleuræ chestnut-brown, with patches of white scales.

Abdomen.—Dark brown, with violet reflections; median line of ochre scales, which are thickest at the bases of the segments; venter covered with creamy-yellow scales.

Wings.—With submarginal cell longer and narrower than the second posterior, its stem equal to about two-thirds of the cell.

Legs.—Covered with deep brown scales; femora whitish.

Remarks.—102 specimens of this form were taken at the following places: Nassau, June 22, July 2; Andros, June 26; Tarpum Bay, July 2; Current Settlement, July 5; Powells Point, July 8; Long Island, July 15; Watlings Island, July 13.

CULEX CYANESCENS Coq.

Culex cyanescens Coquillett, 1902, Jour. N. Y. Ent. Soc., vol. x, p. 46.

DESCRIPTION.—"Black; stems of halteres and femora, except their apices, yellow; occiput rather densely covered with broad, appressed, yellow scales, and narrow, upright, yellow ones changing to black at the sides and posterior edge, a spot of violet-blue appressed scales near middle of each outer edge of the occiput; palpi covered with broad, appressed, brassy-yellow scales, the spots at the posterior angles of the segments considerably produced forward at their inner ends; scales at apices of femora, on hind tibiæ and front side of the others; also on tarsi, violet-blue; tarsal claws large, one-toothed; wings greyish hyaline, veins chiefly blue; lateral scales narrow and elongate, petiole of first submarginal cell four-fifths as long as the cell; posterior cross-vein about its own length from the small one. Length 4 to 5.5 mm."

Remarks.—One specimen of this form was taken at Tarpum Bay, July 7.

CULEX JAMAICENSIS Theob.

Plate XLIX, Fig. 2.

Culex jamaicensis Theobald, 1901, Mon. Culic., vol. i, p. 345.

DESCRIPTION. *Color.*—Dark brown or black.

Size.—Medium sized, 4.5 to 5.5 mm.

Head.—Brown, with scattered, curved, cinereous scales, and black, upright, forked ones, white and black, upright, forked ones at the sides of the

head, and numerous black bristles; eyes silvery; clypeus chestnut-brown, nude; antennæ brown; palpi brown, with same yellow scales, white at the apex, with long, dark bristles; proboscis black at the tip and base, the middle with yellowish scales spread over the brown surface, giving the appearance of a broad, yellowish band.

Thorax.—Dark brown, with four round patches of creamy scales and a few pale ones in front of the scutellum; pleuræ with patches of grey scales; scutellum with pale, curved scales and deep brown border bristles; mesonotum deep brown, nude.

Abdomen.—Dark brown or black, the various segments with distinct creamy patches of apical scales, last segment mostly black, ventrally with pale yellow and brown scales, with a few black marks.

Wings.—Veins covered with black and white scales, with one small deep black spot at the base of the third longitudinal vein where it meets the cross veins.

Legs.—Brown; banded and speckled with yellowish scales, giving the legs a mottled appearance; fore femora black; knee white; tibiæ black, spotted with yellow scales; metatarsus with a basal and median band of yellow, first two tarsi basally white, banded, remainder black: in the midlegs the markings are the same, but there is a trace of banding on the third tarsus, and the femora are whitish beneath, except at the apex; in the hind legs all the tarsal joints are basally banded, ventrally are similar to midlegs.

Remarks.—11 specimens of this form were taken at the following places: Nassau, June 22; Andros, June 26; Green Cay, June 26.

Culex nanus Coq.

Culex nanus Coquillett, 1903, Can. Ent., vol. xxxv, p. 256.

Description.—" Near *jamaicensis,* but much smaller, the light colored scales on the tibiæ not collected into spots; mesonotum without round spots of yellowish scales. Black, the base of antennæ, except the first joint, a band at middle of proboscis, the halteres and bases of femora yellow, scales and hairs of palpi black, appressed scales of occiput golden-yellow, the upright ones black; scales of mesonotum golden-yellow, those of abdomen black and with a broad cross-band of whitish ones on the hind margin of each segment, the last two segments nearly wholly whitish scaled; scales of venter white, those of femora and tibiæ mixed black and whitish, the latter forming a ring nearly

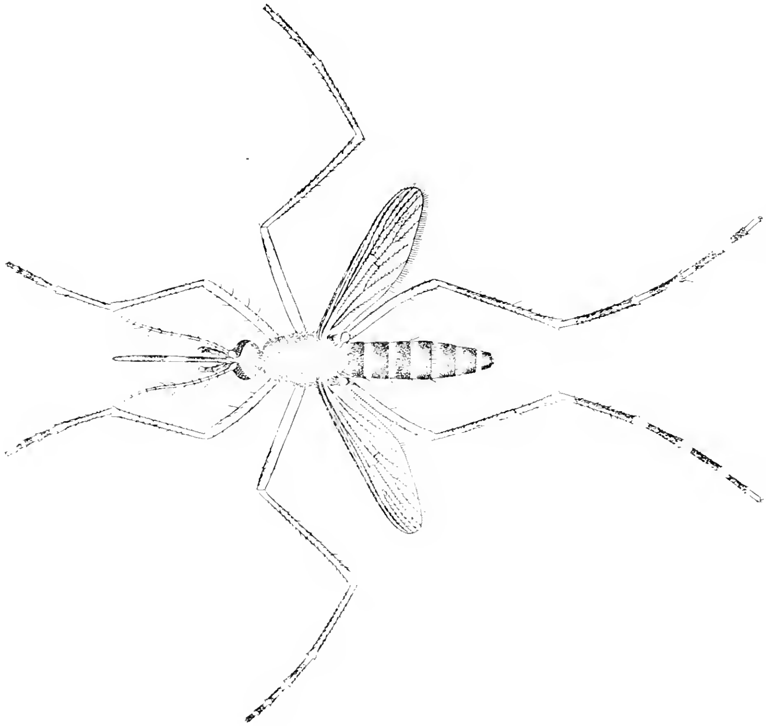

FIG. 2.—CULEX TÆNIORYNCHUS WIED.

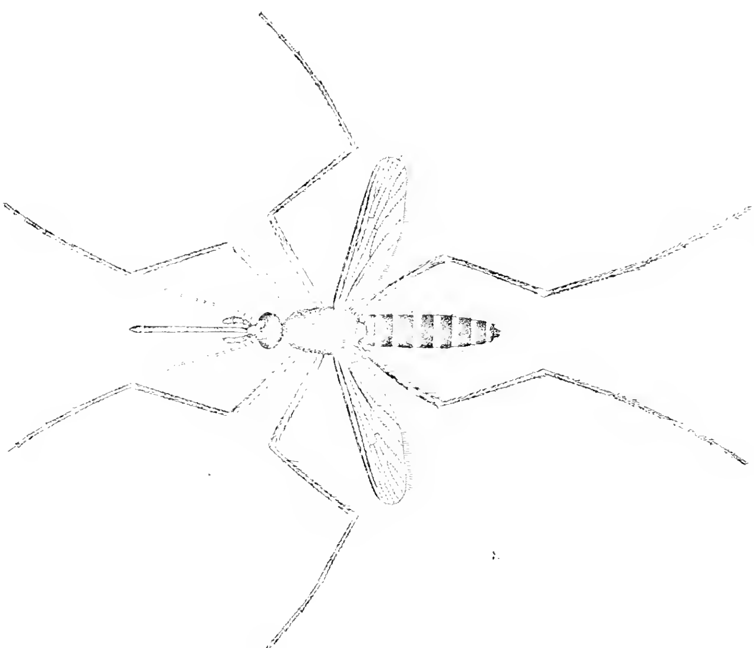

FIG. 1.—CULEX RESTUANS THEOB.

BAHAMA MOSQUITOES

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three-fourths the length of each femur; scales of tarsi black, those at narrow bases of joints whitish; tarsal claws simple; wings hyaline, the scales mixed black and white; the black ones not collected into spots; lateral scales of the anterior veins narrowly lanceolate, those of the other veins almost linear. Length, 4 to 5.5 mm."

Remarks.—71 specimens of this form were taken at the following places: Nassau, June 23; Andros, June 26; Tarpum Bay, July 7; Cat Island, July 9.

CULEX PIPIENS Linné.

Culex pipiens Linné, 1758, Syst. Nat., ed. x, p. 602.

DESCRIPTION. *Color.*—Dark brown.

Size.—4.5 to 6 mm.

Head.—With curved golden-brown scales in front, and in the middle numerous dark-brown, upright, forked ones; the sides covered with creamy-white flat scales; antennæ dark brown, with pale pubescence; palpi thick, brown, with some greyish scales; proboscis ochraceous-brown in the middle, black towards apex and base, extreme tip ochraceous; eyes deep purplish-black, with a few silvery markings.

Thorax.—Dark brown, with golden-brown, curved scales, and three rows of black bristles; in some specimens dark, thoracic stripes show through the scales in front; scutellum with pale golden curved scales and golden-brown bristles; pleuræ chestnut-brown, with a few small patches of pale creamy scales; mesonotum pale chestnut-brown.

Abdomen.—Covered with dusky-brown scales, and the bases of the segments with distinct cross-bands of whitish or flaxen-yellow scales; venter with pale yellowish scales.

Wings.—The veins covered with long brown scales, first submarginal cell long and narrow, its stem very short; base of the first submarginal cell beyond junction of subcostal and costal; fringe brown, with pale reflections.

Legs.—Unbanded; brown, with an ochraceous luster; coxæ yellowish-brown; femora pale beneath, knee spot white, tarsi dark brown.

Remarks.—71 specimens of this form were taken at the following places: Nassau, June 9; Spanish Wells, July 4; Current Settlement, July 5; Tarpum Bay, July 7; Powells Point, July 8; Cat Island, July 9.

Culex restuans Theob.

Plate L, Fig. 1.

Culex restuans Theobald, 1901, Mon. Culic., vol. ii, p. 142.

Description. *Color.*—Chestnut-brown.

Size.—5 to 6 mm.

Head.—Black, with numerous pale, creamy, curved scales, and black, upright, forked ones, flat white scales at sides of head; palpi black, greyish at tip; antennæ with basal joint and base of second joint testaceous, remainder blackish-brown.

Thorax.—Bright, chestnut-brown, short, bright, golden-brown curved scales; scutellum pale; mesonotum ochraceous-brown; pleuræ pale, testaceous, with four patches of white scales.

Abdomen.—Ochraceous, covered with dusky-brown scales; first segment ochraceous, with two median tufts of blackish scales and long golden hairs.

Legs.—With coxæ, bases and under sides of femora almost white, remainder deep, bronzy-brown to almost black; claws equal and simple.

Remarks.—4 specimens of this form were taken at Governors Harbor, July 6.

Culex serratus Theob.

Culex serratus Theobald, 1901, Mon. Culic., vol. ii, p. 45.

Description. *Color.*—Dark brown.

Size.—5.5 to 6.5 mm.

Head.—Brown, clothed with white scales in front and in the middle, brown above and white at the sides, with a few upright, yellow, forked scales; eyes purple, bordered with a narrow edge of white; antennæ brown; palpi black, with a few dark grey scales; proboscis black.

Thorax.—Dark brown, with a broad stripe of creamy grey scales in the middle; scutellum brown, with whitsh scales in the middle and black laterally; mesonotum chestnut-brown, pleuræ testaceous, with patches of white scales.

Abdomen.—Covered with dark, brownish-black scales, with purplish reflections; laterally there is a basal silvery-white spot, which partially shows on the dorsum; first segment ochraceous with a patch of purple scales in the middle and very pilose; venter almost entirely clothed with white scales.

Legs.—Dark brown, ungues equal and unserrated.

Wings.—With a dusky yellow tinge, testaceous at base; veins clothed with dark brown scales.

Remarks.—1 specimen of this form was taken at Nassau, June 24.

Culex sollicitans Walk.

Culex sollicitans Walker, 1852, Ins. Saund. Dept., vol. i, p. 427.

Description. *Color.*—Brownish.

Size.—About 6 mm.

Head.—Brown, with dense golden, curved, hair-like scales which project in front of the eyes as a dense tuft of hairs; antennæ testaceous at the base, black for the remainder; palpi covered with dark brown scales, and with a white apex; proboscis black, with a distinct yellowish-white band in the middle; eyes silvery.

Thorax.—Brown, covered with golden-brown, thin, curved, scaled; scutellum similarly covered, and with bright, golden-brown bristles on the border; mesonotum chestnut-brown; pleuræ dark brown, densely covored with white scales.

Abdomen.—With creamy-white to yellow scales, forming a central broad line, and with basal white bands, with a dark brown to nearly black quadrangular patch on each side of the central mass of pale scales; venter with pale creamy scales.

Wings.—With testaceous veins and pale brown scales; first submarginal cell longer and narrower than the second posterior cell; posterior cross-vein about its own length distant from mid-cross-vein.

Legs.—Ochraceous, mottled with black and white scales, knee spot white; fore metatarsi without a basal white band.

Remarks.—41 specimens of this form were taken at the following places: Andros, June 26; Green Cay, June 29; Rum Cay, July 10; Watlings, July 13.

Culex tæniorynchus Wied.

Plate L, Fig. 2.

Culex tæniorynchus Wiedemann, 1821, Dept. Exot., pt. i, p. 43.

Description. *Color.*—Brownish.

Size.—5 to 5.8 mm.

Head.—With golden and creamy scales, forming a groundwork, with numerous black, upright, forked scales all over the occiput; eyes silvery; clypeus bright brown; antennæ brown; palpi yellowish, with black scales at base and towards apex; extreme apex with white scales; proboscis dark brown, with a creamy white band about its middle.

Thorax.—Dark purplish-brown, covered with golden-brown, curved, hair-like scales, and some black bristles in three rows; scutellum deep purplish-brown, with testaceous patches and black bristles with golden hair-like scales; mesonotum chestnut-brown; pleuræ deep brown, with patches of white scales.

Abdomen.—Densely covered with deep purplish-black scales, each segment with a narrow basal band of pale yellowish-white scales, and pure lateral spots; ventrally similarly covered as the dorsum.

Legs.—Fore legs dark brown, bases of first and second tarsal joints white, last two joints black; midlegs, femora black above, creamy below, metatarsus basally white banded, also the first two tarsal joints; hind legs, the metatarsus and first three tarsal joints are basally white banded; the last joint pure white, otherwise like midlegs.

Remarks.—217 specimens of this form were taken at the following places: Nassau, June 22, July 2; Andros, June 26; Governors Harbor, July 6; Powells Point, July 8; Rum Cay, July 10; Watlings, July 13; Current Settlement, July 15; Long Island, July 15.

Culex territans Walk.

Plate LI, Fig. 1.

Culex territans Walker, Ins. Saund. Dept., vol. ii, p. 428.

Description. *Color.*—Brown.

Size.—6 mm.

Head.—Brown, with narrow, curved, deep golden-brown scales and upright, darker, forked ones; antennæ dark-brown, testaceous at base; palpi brown; proboscis brown, black at the apex.

Thorax.—Brown, with two dark lines, and covered with small curved, hair-like scales of rich golden-brown tint, and with dark brown bristles; scutellum brown, pleuræ brown, with a few white scales.

Abdomen.—Covered with brown scales, some paler than others, and showing faint traces of apical bands.

Legs.—Dark brown, ungues equal and simple.

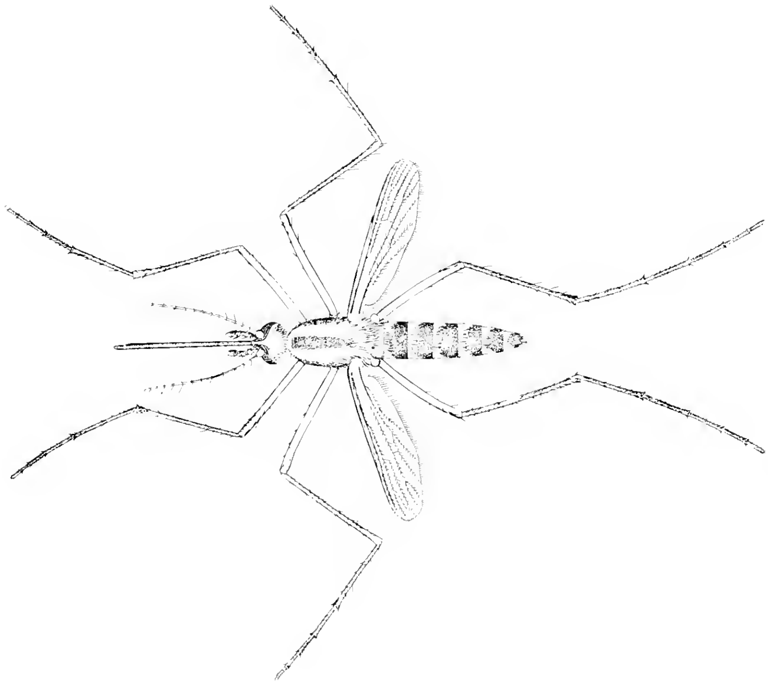


FIG. 2.—CULEX TRIVITATTUS COQ.

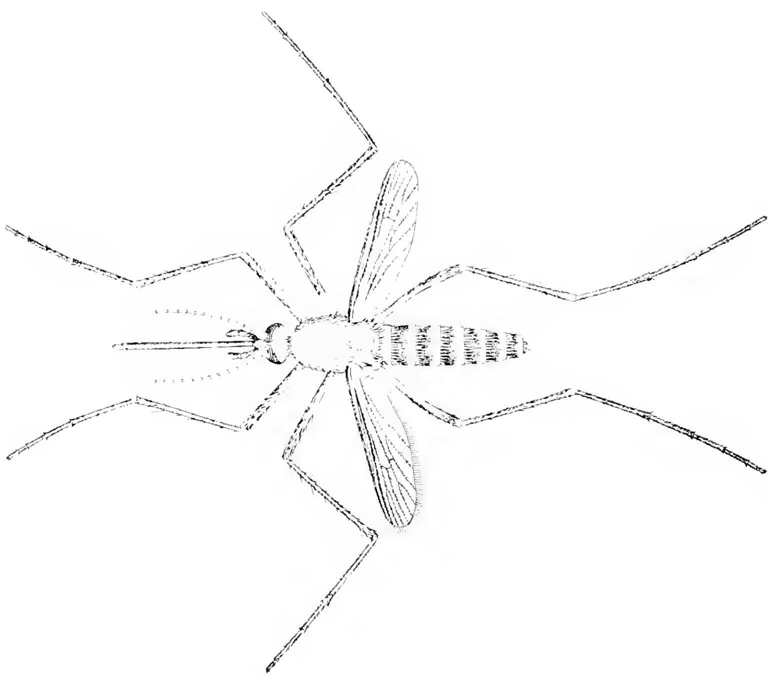


FIG. 1.—CULEX TERRITANS WALK.

BAHAMA MOSQUITOES

[Published by courtesy of Dr. L. O. Howard]

Wings.—With narrow, long, lateral, brown scales, and with the first submarginal cell considerably longer and narrower than second posterior cell; stem very short, as in *Culex pipiens* Linné; halteres with pale brown stem and dark brown knob.

Remarks.—5 specimens of this form were taken at Nassau, July 2.

Culex trivitattus Coq.

Plate LI, Fig. 2

Culex trivitattus Coquillett, 1902, Jour. N. Y. Ent. Soc., vol. x, p. 193.

Description.—"Black. Near *Culex triseriatus,* but with three vittæ of blackish scales on the mesonotum; the first joint of antennæ and base of second, the coxæ, and greater portion of femora, yellow; scales of palpi black, those on the occiput light yellow, a large patch of dark grey ones on each side of the middle, the upright ones yellow; scales of mesonotum brassy-yellow, and with three broad vittæ of blackish ones, the median vittæ not quite extending to either end of the mesonotum; scales of abdomen black, those at the front angles of the segments and on the venter, whitish; scales of the legs black, those on coxæ and on the posterior side of the femora and tibiæ, covering nearly the whole of the hind femora, yellowish-white; tarsal claws rather large, one-toothed; wings hyaline, lateral elongated scales of the veins narrow and almost linear, second basal cell shorter than the first, petiole of first submarginal cell nearly one-half as long as the cell. Length 4.5 to 5.5 mm."

Remarks.—21 specimens of this form were taken at Tarpum Bay, July 7.

FISHES OF THE BAHAMA ISLANDS

FISHES OF THE BAHAMA ISLANDS

BY

BARTON A. BEAN,

Assistant Curator of the Division of Fishes, U. S. National Museum.

INTRODUCTION.

The Bahama Islands, lying as they do between latitudes 21° and 28° north, have a tropical fish fauna, similar to other parts of the West Indies; ninety per cent of the list of one hundred and eighty-three Bahama species here enumerated as collections in the U. S. National Museum and elsewhere, made largely by the Bahama Expedition in 1903, and by the Bureau of Fisheries steamer *Albatross* in 1886, are credited to the West Indian fauna. Forty per cent of this list have also been found in Bermuda, and seventy per cent along and close to the Florida coast. But eight and one-half per cent of this list have been recorded from the Pacific.

A comparison with the Bermuda fauna shows an exceedingly close relationship between it and the Bahama fauna. Almost all of the fishes known to the waters of Bermuda are found in the waters of the Bahamas. In fact, Bermuda is the northeast end of the West Indian region, which includes the Bahamas.

The fish fauna of the Bahamas is varied, but not so rich as other similar faunas; certain forms are rare, comparatively speaking, and the hauls made with the twenty-fathom seine, twelve feet deep, and of fine mesh, were usually surprisingly light, both as to number of species and individuals taken. It was only possible to draw the seines on smooth shores, plenty of which were found, but the waters at the time of our visit seemed more or less barren. The fishes on the coral heads were fairly abundant, such forms as *Chlorichthys*, *Iridio*, *Balistes*, etc., being quite common, as were the young tang. The *Chætodonts* were rare. Our observations led us to agree with Professor Mayer, who says: "The Bahama region is richer in corals, poorer in fishes and in invertebrates, and far poorer in pelagic life than that of the Tortugas."

It is quite impossible to give statistics as to the number and value of the fishes taken in the Bahamas. No record is kept of fishes sold in the markets. Low prices prevail and in the absence of the best grades of beef, mutton and the like, large quantities of fishes are annually consumed. At the time of our visit, June 16 to July 20, 1903, the supply of fish in the wells of the boats in Nassau harbor seemed to be ample and in excess of the demand. The following kinds are esteemed as food: snapper, mutton-fish, groupers, pompano, grunts, jacks, runners, porgies, angel-fish, pork-fish, hog-fish, tangs, turbot and shell-fish. Those considered of fair quality are: bonito, king-fish, shad (*Gerres*), goat-fish, mullet, goggle-eye, squirrel-fish, hound-fish, flying-fish, amber-fish or amber jack, etc.

Of the one hundred and eighty-three species here enumerated fully forty-two are of primary importance as food-fishes, while twenty-four may be regarded as of secondary importance. About ten other species are sometimes eaten, but little esteemed, and a few are often unfit for human consumption, being poisonous. The Barracuda, though eaten at times, will often cause great discomfort to those partaking of its flesh. In speaking of the morays Catesby says:[1] "The inhabitants of the Bahama Islands will eat only the green sort, rejecting those which are black as poisonous." He also refers to the unicorn-fish (*Alutera scripta*) as being poisonous, and of the rock-fish (*Perca marina venenosa punctata*) says:[2] "This fish has a worst character for its poisonous quality of any other among the Bahama Islands."

As will readily be seen by the illustrations (Plates LII-LXI) from drawings by Mr. A. H. Baldwin, the fishes of the Bahamas are not only useful for food, but also as an attraction to the many visitors to the Islands. Their beauty in life, as they swim to and fro among the sea fans and corals, is indescribable, and one never tires looking through the water bucket with glass bottom, or better still, through the floor of a glass-bottom boat. The "Sea Gardens" of Nassau harbor are famous for their beauty, but they are meager in attraction to some of the bottoms observed farther south. The rock-beauties, angel-fishes, turbot, tang, parrot-fishes, pork-fish, hog-fish, cock-eye pilot, and many others are plainly seen in the clear water and as they flash their beautiful colors fill the observer with wonder and admiration.[3]

[1] The Natural History of Carolina, Florida, and the Bahama Islands, etc., Vol. II, 1743.

[2] *Loc. cit.*

[3] Popular accounts of the fishes of the Bahamas are to be found in American Fishes, Goode, and in American Food and Game Fishes, Jordan and Evermann.

For collecting in the Bahamas seines are useful, but they should not be too long nor deep; seventy-five feet long and eight feet deep, with a fine-mesh pocket, would probably prove of more service in the shallow waters than longer nets. The Bahama traps are useful, but should be specially constructed of closer woven wire than that used for commercial purposes. Dip-nets from four to six feet square, held out by spreaders and baited with conch meat, were found most successful in capturing beautiful fishes around the coral heads. These fishes will nibble longer at the bait offered them on hooks without being captured than any we have heretofore seen. The oyster dredge fitted with netting did quite well, but the tangle bars for deep water were lost on the several occasions used. This was much to be regretted, as many good things were expected from this sort of fishing.

The meat of the conch is much used as bait. The groupers, grunts and the like are known as bottom fish and are taken by hook and line, while the shad and jacks swim near the surface and are taken in nets. The so-called "passing jack" or "black jack" is said to be one of the best fishes running into Nassau harbor and other places among the Islands. They are taken in large numbers in August and September by means of nets quickly drawn around the schools.

I would express my thanks to Mr. Joseph S. Lewis, of the Johns Hopkins Medical School, and to Mr. J. B. G. Custis, both of whom were assigned to me as assistants in collecting, and to Mr. Randall, who had charge of the launch. To Messrs. Augustus Willige and C. A. McKnew, assistants in the Division of Fishes, thanks are due for help rendered in identifying the collections.

ANNOTATED LIST OF BAHAMA FISHES.

The Bahama Expedition of 1903 collected some highly interesting forms, *Stathmonotus, Chriodorus* and *Verma* having heretofore been recorded only from Florida, and the curious goby, *Garmannia,* indefinitely assigned to the West Indies. So far as the list here given is concerned, I need hardly say that it is very incomplete as a catalogue of the whole Bahama fish fauna, but I have thought it best to confine myself at this time to the specimens at hand and not give a list from recorded species and supposition as to what may be found in the region under discussion.

The ocean deepens rapidly at many places around the Islands and the deep-sea fauna must be rich. Such forms as *Gonostoma, Stomias* and *Echio-*

stoma have been found in the Bahama Channel, also *Pseudoscopelus* in the Old Bahama Straits.

Family BRANCHIOSTOMATIDÆ (Lancelets).

Asymmetron lucayanum Andrews.

This form has been found at Bimini and Nassau. Adult and young were obtained by Dr. Andrews, found swimming at the surface in the evening in June and July, 1892. It was found also in calcareous sand.

Family GINGLYMOSTOMIDÆ (Nurse Sharks).

Ginglymostoma cirratum Gmelin (Nurse Shark).

Large shark abundant about the coral reefs of the West Indies and on the west coast of Mexico. A female of this species was taken by the Expedition at Green Cay on June 29, 1903. It was 7 feet 9 inches long and contained seventeen egg capsules. Numerous specimens were seen.

Family GALEIDÆ (Requiem Sharks).

Hypoprion brevirostris Poey (Short-nosed Shark).

This shark grows to a length of 7 feet; it ranges throughout the West Indies and was taken by the steamer *Albatross* at Watlings Island, March 5, 1886.

Carcharhinus obscurus Le Sueur (Dusky Shark).

Middle Atlantic Ocean. Grows to a length of 9 or 10 feet. Numerous examples of what the writer took to be this shark were observed north of Abaco Island. They followed the wake of the vessel, often coming to the surface close by, affording a good target for the rifles aboard, but seemed to be little disturbed by the bullets shot at them.

Family SPHYRNIDÆ (Hammer-headed Sharks).

Sphyrna tiburo Linnæus (Shovel-head Shark).

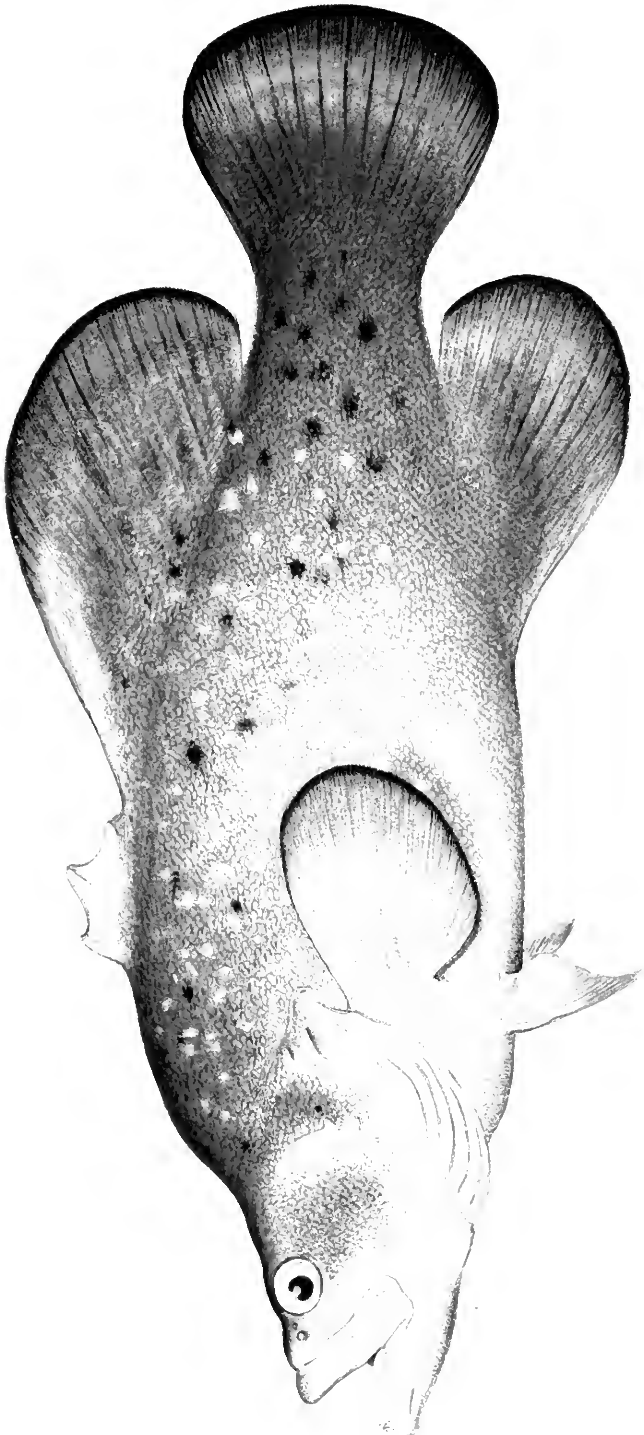
The maximum length of this shark is about 5 feet; it has an exceedingly wide range, occurring from the coast of Long Island, throughout the West Indies, and across the Pacific to China. The steamer *Albatross* secured specimens north of Abaco in 1886.

Family DASYATIDÆ (Sting Rays).

Urolophus jamaicensis Cuvier (Round Sting Ray).

This form occurs throughout the West Indies, and was obtained by the Expedition at Nassau, and at the eastern end of Hog Island.

A. HOEN & CO., Lith.



Rhypticus bistrispinus (Mitchill)

SOAP FISH

2/3 NATURAL SIZE

A. H. BALDWIN
ad nat. del.

Family ALBULIDÆ (Lady Fishes).

ALBULA VULPES Linnæus (Lady Fish).

Tropical seas on both coasts of North America, northward in the Atlantic to Cape Cod and in the Pacific to San Diego.

Collected by the Expedition at Spanish Wells, July 4, 1903.

Other common names for this fish are: "banana-fish," "bone-fish" and "macaibi."

Family ELOPIDÆ (Tarpons).

ELOPS SAURUS Linnæus (Big-eyed Herring).

This rather indifferent food-fish reaches a length of 3 feet or more; it is found in all tropical seas and strays northward to Massachusetts and Lower California.

Collected by the Expedition at the east end of Hog Island, June 18, 1903. The young were abundant.

Family CLUPEIDÆ (Herrings).

JENKINSIA STOLIFERA Jordan and Gilbert.

This interesting little fish, heretofore known from the Gulf of Mexico (Key West to Yucatan), was obtained by the Expedition at Spanish Wells, July 4, 1903.

SARDINELLA SARDINA (Poey) (Scaled Sardine).

West Indian fauna; abundant. Collected by the steamer *Albatross* at Nassau.

SARDINELLA CLUPEOLA (Cuvier and Valenciennes).

Green Turtle Cay, 1888. C. L. Edwards.

Family SYNODONTIDÆ (Lizard-Fishes).

SYNODUS INTERMEDIUS (Agassiz) (Lizard-fish).

A very large specimen was observed by me in Nassau Harbor, but we failed to secure it. It refused all bait offered and the attempts to grapple it with large hooks were unsuccessful. Several small specimens were taken.

The steamer *Albatross* collected *S. intermedius* at Watlings Island and Abaco.

TRACHINOCEPHALUS MYOPS Forster (Ground Spearing; Lagarto).

Abundantly distributed throughout the West Indies and occurring northward on Atlantic coast to the Carolinas. Collected by the Expedition at Clarence Harbor, July 15, and off an island near Nassau, July 20, 1903.

Family MURÆNESOCIDÆ.

STILBISCUS EDWARDSI Jordan and Bollman.

Collected at Green Turtle Cay in 1888, by Charles L. Edwards. Described in Proc. U. S. Nat. Mus., Vol. XI, 1888, p. 549.

Family OPHICHTHYIDÆ (Snake Eels).

SPHAGEBRANCHUS ANGUIFORMIS (Peters).

Collected by Glover M. Allen and Thomas Barbour off Abaco, 1904, and referred to in their "Narrative of a trip to the Bahamas," Cambridge, Mass., Dec., 1904; privately printed.

VERMA KENDALLI Gilbert.

A single species belonging to the family *Ophichthyidæ* (snake eels), heretofore known only on the coast of Florida, was obtained by the Expedition at Green Cay, June 30, 1903.

Family MURÆNIDÆ (Morays).

LYCODONTIS MORINGA Cuvier (Common Spotted Moray).

This distinctly marked eel reaches a length of 3 feet. It has been found in the West Indies and about Florida, ranging as far southward as Rio Janeiro and St. Helena. In the middle of July, 1903, a specimen was taken by the Expedition at Nassau.

LYCODONTIS FUNEBRIS Ranzani (Black Moray).

This eel is the largest of our American species, reaching a length of 6 feet or more and being noted for its extreme ferocity. It is common on both of our coasts, from Florida Keys to Rio Janeiro and Gulf of California to Panama. A specimen was obtained by the steamer *Albatross* at Nassau during March, 1886.

ECHIDNA CATENATA Bloch.

A form of the most highly specialized morays; small in size but generally common in the West Indies and from Bermuda to Surinam. Collected by the steamer *Albatross* at Abaco in March, 1886.

Family MYRIDÆ (Worm Eels).

MYROPHIS PUNCTATUS Lütken.

This species of eel, resembling an earthworm in appearance and size, is found in the West Indies and along the Gulf Coast southward to Surinam. Two specimens were collected by the Expedition off Governors Island, July 7, 1903. Taken by oyster dredge in 5 fathoms of water on a bottom of coral sand.

Family PŒCILIIDÆ (Killifishes).

CYPRINODON VARIEGATUS Lacépède (Sheepshead Minnow).

This little fish is widely distributed, being found in brackish waters from Cape Cod to the Rio Grande. Very abundant in the lake near Cockburn Town, Watlings Island, where specimens were found by the Expedition, July 11, 1903.

Cyprinodon variegatus riverendi, described by Poey from Cuban specimens, has also been recorded from the Florida Keys and obtained by the steamer *Albatross* at Green Cay, April 12, 1886.

GAMBUSIA AFFINIS Baird and Girard (Top Minnow).

This interesting little fish, known to the Cubans as "guajacones," and named *Gambusia* by Poey after the Cuban word *gambusino*, meaning nothing, reaches a length of but 2 inches. It is viviparous, the young coming forth in the summer when about one-third of an inch long.

The top minnow is found in marshes and lagoons of the southern and Gulf coasts from Delaware to Mexico, often ascending rivers into fresh water. Collected by the Expedition in lake near Cockburn Town, Watlings Island, July 11, 1903.

Family EXOCŒTIDÆ (Flying-fishes).

EXOCŒTUS LINEATUS Cuvier and Valenciennes (Striped Flying-fish).

Found in the warm seas of the Atlantic, but not abundantly. Specimens have been recorded as taken from Corea, the Madeiras, Canaries and Bermuda. The specimen secured by the Expedition flew aboard the ship at Cat Island during the night of July 8, 1903.

Family HEMIRHAMPHIDÆ (Half-beak Gars).

HEMIRHAMPHUS BRASILIENSIS Linnæus (Half-beak).

Grows to a length of 15 inches, is a good food-fish, and is found in more or less abundance from Key West, Florida, southward to Brazil. Obtained by the Expedition at Clarence Harbor, July 14, 1903. It seemed to be rare in the Bahamas at the time of our visit.

CHRIODORUS ATHERINOIDES Goode and Bean (Hard Head).

This interesting fish, heretofore recorded only from Key West, Florida, was obtained by the Expedition at Spanish Wells, July 4, 1903. A single example, $4\frac{3}{4}$ inches long.

Family ESOCIDÆ (Gars).

TYLOSURUS NOTATUS Poey (Silver Gar).

This species, known also as "long jaws" and "needle-fish," is common at Key West and throughout the West Indies. It reaches a length of 20 inches. Obtained by the Expedition at Nassau and Spanish Wells during June and July, 1903, being especially abundant at the latter place.

TYLOSURUS CARIBBÆUS Le Sueur (Silver Gar).

This species inhabits the West Indies. One specimen was obtained by me at Nassau during June, 1903.

TYLOSURUS ACUS Lacépède (Hound Fish).

Plate LIII.

This fish grows to a length of 4 feet and has been recorded from the West Indies, the Bahamas and Bermuda. It occasionally strays northward to the coast of Massachusetts. Taken by the Expedition at Spanish Wells, July 4, and at Clarence Harbor, July 15, 1903.

Family SPHYRÆNIDÆ (Barracudas).

SPHYRÆNA PICUDA Bloch and Schneider (Barracuda).

The great Barracuda, Picuda, or Becuna, grows to a length of 6 feet and may well be termed the wolf of the sea. It is eaten but not much esteemed. Very common in the tropics, ranging the high seas throughout the West Indies, from Brazil northward, including Bermuda, to the New England coast. Taken by the Expedition at Spanish Wells, Governors Harbor, Powells Point, Clarence Harbor and Nassau during June and July, 1903.

Family ATHERINIDÆ (Silversides).

ATHERINA STIPES Müller and Troschel (Friars).

This species includes the *A. laticeps* of Poey. It is abundant throughout the West Indies, the Gulf of Mexico and the Bahamas. Of small size and only food for other fishes. Taken by the Expedition near Nassau, Spanish Wells, the Current, and Clarence Harbor during June and July, 1903.

ATHERINA ARÆA Jordan and Gilbert (Slender Friar).

By no means rare, but occurring in less abundance than *A. stipes*. It is found in the Gulf of Mexico, at Key West and Cozumel; specimens also having been collected by the steamer *Albatross* at Watlings Island, Rum Cay, Cat Island and Abaco during March, 1886.

Family MUGILIDÆ (Mullets).

MUGIL CUREMA Cuvier and Valenciennes (White Mullet).

An important food-fish, running in large schools and ranging on both our coasts from Cape Cod to Brazil and Magdalena Bay to Chili. It grows to a foot in length. Taken by the Expedition at Powells Point, July 8, 1903.

"Blue-back mullet," "Liza" and "Liza Blanca" are names also applied to this fish.

MUGIL TRICHODON Poey (Fan-tailed Mullet).

A deeper fish than the *M. curema* and having a less extensive range, occurring from Florida Keys to Brazil; abundant at Key West, but rare about Cuba. One specimen was collected by the Expedition at Spanish Wells, July 4, 1903.

Family HOLOCENTRIDÆ (Squirrel-fishes).

HOLOCENTRUS ASCENSIONIS Osbeck (Squirrel-fish).

This is one of the most brilliantly colored of our tropical fishes. It attains a length of about 2 feet and may be found around the rocks and reefs of the West Indies; ranging from Florida to St. Helena; the Expedition secured a specimen in Nassau harbor, June 23, 1903. It is not very important as a food-fish, but is frequently seen in the tropical markets. Observed in Nassau market.

HOLOCENTRUS VEXILLARIUS Poey.

Taken by the steamer *Albatross* at Abaco, April, 1886.

HOLOCENTRUS CORUSCUS Poey (Squirrel-fish).

Recorded from Green Turtle Cay, where it was taken by C. L. Edwards in 1888.

HOLOCENTRUS SICCIFER Cope.

Described in 1866 from a specimen taken at New Providence.

Family SCOMBRIDÆ (Mackerels).

Gymnosarda alleterata (Rafinesque) (Bonito).

This fish, known in the Mediterranean as "Tunny," is common throughout the West Indies and ranges northward to Cape Cod. It is a good food-fish. An example was obtained by the Expedition on a trolling line, between Andros Island and Green Cay, on June 28, 1903.

Scomberomorus cavalla Cuvier and Valenciennes (King-fish or Cero).

This large fish is common in the West Indian region. It attains a length of 5 feet or more and is used as food. Observed in the Nassau market.

Family CARANGIDÆ (Pompanos).

Caranx bartholomei Cuvier and Valenciennes (Yellow Jack).

An indifferent food-fish, occurring in the West Indies and frequently straying northwards as far as the Carolinas. It was taken in April, 1886, by the steamer *Albatross* at Nassau.

Caranx crysos Mitchill (Jack).

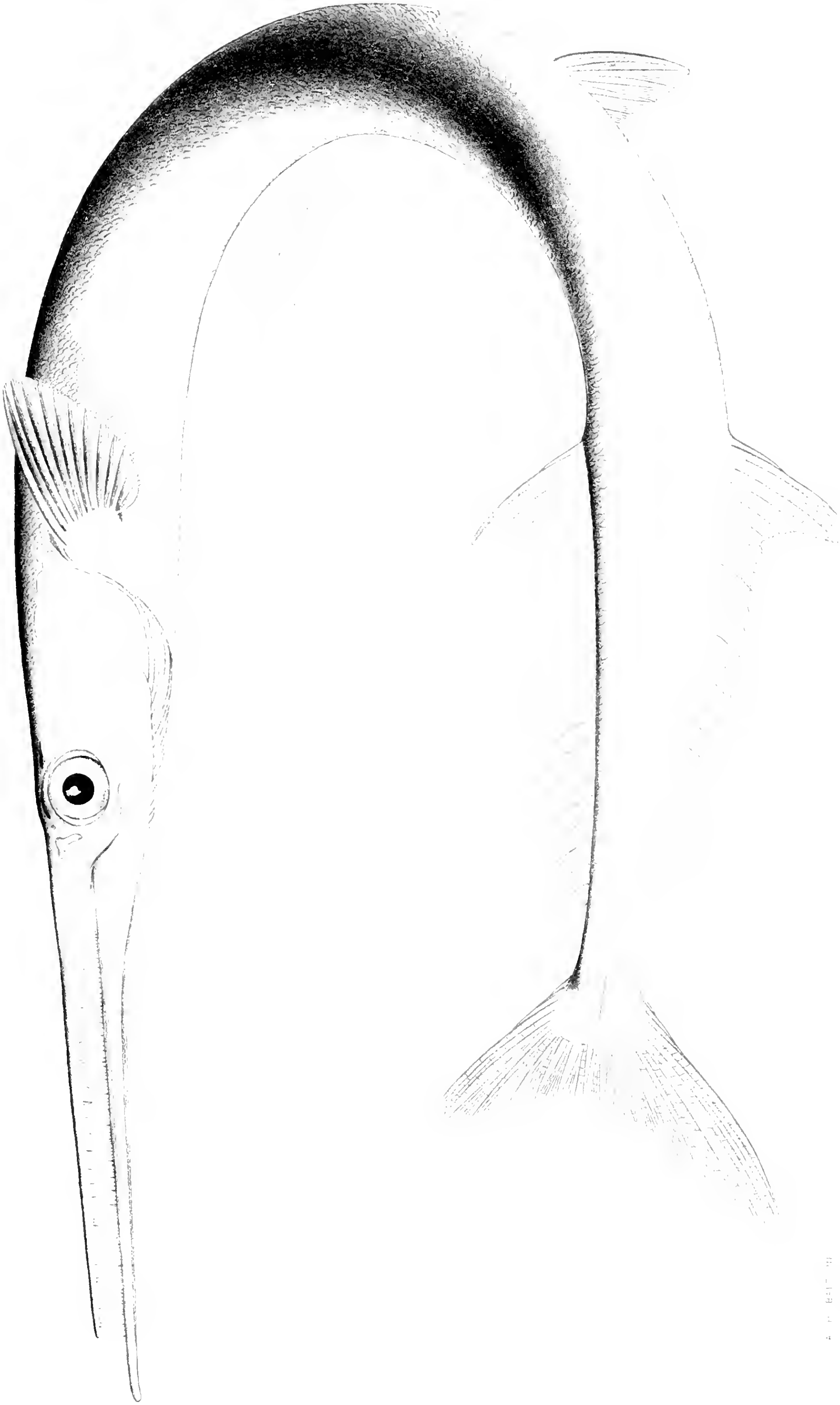
Unlike *C. bartholomei* Cuv. and Valen., this fish has gained rather a prominent name among the food-fishes, more especially in the West Indies, where it occurs in abundance. Its range is also greater, covering the western Atlantic from Cape Cod to Brazil. Its qualities as a game fish have made it a favorite with many sportsmen. "Crévalle," "runner," "jurel" and "yellow mackerel" are other names applied to this fish. Several specimens were secured at Nassau by the steamer *Albatross* in April, 1886.

Caranx latus Agassiz (Horse-eye Jack).

This species of *Caranx* is found on the west coast of Mexico, in the West Indies, and ofttimes as far north as Virginia. It is generally regarded as poisonous and causing the disease known as Ciguatera if eaten. A specimen was taken by the Expedition near Cape Hatteras in June, 1903, several more being secured at Spanish Wells and Clarence Harbor in July, 1903.

Caranx ruber Bloch (Carbonero).

Found only in the West Indies heretofore; a single specimen was secured at Nassau in June, 1903, by the Expedition. It is much less abundant than the other *Caranx* mentioned above, and for this reason has no value as a food-fish.



A. HOEN & CO., Lith.

Tylosurus caribbaeus (Le Sueur)
HOUND FISH
2/3 NATURAL SIZE

ad nat. del.

TRACHUROPS CRUMENOPHTHALMUS Bloch (Goggle-eye).

Also known as "big-eyed scad," "goggle-eye Jack" and "chicharro." It occurs throughout the West Indies northward to Cape Cod, and in the Pacific on the west coast of Mexico. In the Hawaiian Islands it is esteemed as a food-fish, being found in great abundance and called "akule" by the natives. An abundant fish in the Nassau market at the time of our visits in June and July, 1903. A fairly good fish and one of the lowest priced. The usual length of market specimens was 8 or 9 inches.

TRACHINOTUS FALCATUS Linnæus (Round Pompano).

This well-known food-fish exceeds a foot in length and is found in the West Indies; it ranges from Cape Cod to Brazil, being common southward and occasionally found northward in the Gulf Stream as far as Woods Holl. Collected by the Expedition at Tarpum Bay and east end of Hog Island in July, 1903.

TRACHINOTUS GLAUCUS Bloch (Old Wife).

A handsome fish, unimportant as food, found among the West Indies and along the coast from Virginia southward to the Caribbean Sea. In size it rarely exceeds a foot. Several specimens were obtained by the Expedition at Nassau, June 20, 1903.

TRACHINOTUS GOODEI Jordan and Evermann (Great Pompano).

Also commonly called the "permit;" a good food-fish, though not as highly valued as *T. carolinus*. It often grows to a length of 3 feet, specimens of this size weighing about thirty pounds, being the largest size attained by any of the pompanos. It occurs in the West Indies, northward to Florida. Collected by the Expedition at Hog Island, June 18, 1903.

DECAPTERUS MACARELLUS Cuvier and Valenciennes (Mackerel Scad).

Found in the warmer parts of the Atlantic, straying northward to Cape Cod. Of no value as food. Two specimens were taken by the Expedition near the edge of the Gulf Stream off Cape Hatteras, June 6, 1903.

SERIOLA RIVOLIANA Cuvier and Valenciennes (Amber-fish).

As a food-fish this species is unimportant, comparing unfavorably in this respect with the majority of the species in this genus. It is of wide distribution, ranging from the Mediterranean to Brazil, throughout the West Indies and occasionally on the coasts of Florida and South Carolina. A specimen was obtained by the steamer *Albatross*, March 5, 1886.

Large examples of *S. rivoliana* were observed in Nassau Harbor. Two brought to the schooner's side by hand-line fishermen weighed about 50 lbs. each.

Naucrates ductor Linnæus (Pilot-fish).

A fish of wide distribution, inhabiting the open seas, being found occasionally on the Atlantic coast from Cape Cod to the West Indies. Two specimens were taken by the Expedition, the one from the edge of Gulf Stream, the other at N. Lat. 31° 13′, W. Long. 74° 41′, in June, 1903.

Alectis ciliaris (Bloch) (Thread-fish).

Both coasts of tropical America; common around the Florida Keys. Obtained at Green Turtle Cay, 1888, by C. L. Edwards.

Selene vomer Linnæus (Horsehead).

One of the handsomest and commonest of the Moon-fishes, deriving its name of Horsehead and also that of Lookdown from the peculiar shape of its head. Its flesh is excellent, being generally considered a great delicacy. Found on both coasts, from Cape Cod to Brazil, Lower California to Peru; more common about the sandy coasts of tropical America. A specimen was taken by the Expedition at Nassau, June 20, 1903.

Family NOMEIDÆ.

Psenes cyanophrys Cuvier and Valenciennes.

A small fish occurring in the Atlantic, Pacific and Indian oceans, being widely distributed in the warm ocean currents. Secured by the Expedition at Green Cay, June 29, 1903.

Nomeus gronovii Gmelin (Portuguese Man-of-war Fish).

This fish derives its name from its habit of seeking protection beneath the jelly-fish known as the Portuguese man-of-war, moving freely about its poisoned tentacles. The single example obtained by the Expedition was taken with its host in the open ocean southeast of Cape Hatteras in June, 1903.

Family BRAMIDÆ (Pomfrets).

Brama raii Bloch (Pomfret).

Found in the open seas at considerable depths; rarely in the Atlantic, more frequently on the Pacific coast from California north to Puget Sound.

A young specimen was taken near Cape Hatteras, June 15, 1903, by the Expedition. This fish attains a length of 2 to 4 feet. On the Pacific coast it is highly valued as a food-fish.

Family CHEILODIPTERIDÆ (The King of the Mullets).

Apogon pigmentarius (Poey).

An interesting little fish heretofore recorded from Cuba. One specimen was obtained by the Expedition at Golding Key, Andros Island, June 26, 1903. Color in life red; in alcohol whitish, profusely covered with small black spots.

Apogonichthys stellatus Cope.

Two specimens of this rare species were obtained by the Expedition at Golding Key, Andros Island, June 27, 1903. They were of a uniform black color when captured, but since being in alcohol have faded to a reddish-brown with more or less metallic luster, thickly dotted with small dark spots and numerous star-shaped blotches each with a silvery center.

Professor Cope described the species from a specimen (the only one known) said to have come from Nassau. Our specimens are 2 and $2\frac{1}{4}$ inches long.

Family SERRANIDÆ (The Sea Basses).

Epinephelus maculosus Cuvier and Valenciennes (Red Hind).

Plate LVII.

This is one of the smallest of the Groupers. Like all the others it is highly esteemed as food and for its game qualities. It ranges from Carolina to Brazil, being rare on our coast but more frequent in the West Indies and the Bermudas. Several specimens were collected by the Expedition at Nassau during June and July, 1903. It attains a length of about 2 feet.

Epinephelus mystacinus Poey (Cherna de lo Alto).

Found in the deeper waters of the West Indies, southward to Brazil; reaching an approximate length of 2 feet. A good food-fish, but not found in such quantities as to make it of commercial value. Collected by the Expedition at Nassau, June 22, 1903.

Epinephelus striatus Bloch (Nassau Grouper).

This is one of the best marked and most important food-fish of its kind. Found throughout the Bahamas and in the West Indies, northward to Florida.

It often reaches a length of three feet and a weight of about fifty pounds, this being the largest size attained by any of the species of this genus. A fifteen-pound specimen was taken by the Expedition in Clarence Harbor, and the fish was fairly common in the wells of the fishing boats in Nassau harbor in June, 1903. It is also one of the commonest of the food-fishes of Bermuda. The younger forms are known as "Hamlet grouper."

MYCTEROPERCA VENENOSA APUA (Bloch).

West Indies; Florida Keys to Brazil. C. L. Edwards collection, Green Turtle Cay, 1888.

PETROMETOPON CRUENTATUS (Lacépède) (Coney or Red Hind).

This is a handsome fish, reaching a length of 1 foot and inhabiting the waters of the West Indian region generally. It is a fair food-fish. Specimens were obtained by the Expedition at Nassau and Rum Cay in June and July, 1903.

BODIANUS FULVUS (Linnaeus) (Yellow Fish).

This species grows to a length of 1 foot, is a fairly good food-fish, and occurs from Bermuda to Florida and throughout the West Indies. "Nigger-fish," "butter-fish," "guativere" and "guativere amarilla" are other names applied to the species. One example collected by the Expedition at Watlings Island, July 11, 1903.

BODIANUS FULVUS RUBER (Bloch and Schneider) (Red Guativere).

A variety of the preceding, and like it variable in color. Of the same general range. Obtained by the Expedition in Nassau, July 20, 1903.

BODIANUS FULVUS PUNCTATUS (Linnaeus) (Negro Fish).

Plate LVIII.

An old and well-known but rather unimportant food-fish of the Bahamas, Bermuda and the West Indies generally. Dr. Goode in his list of fishes observed and collected in Bermuda during the months of February and March, 1872,[4] says: "The names 'butter-fish' and 'nigger-fish' are in use also at Barbados, St. Thomas and the Bahamas, as applied to this and an allied species. The first refers to the color and soft, oily feeling of the yellow variety; the latter probably also to color."

[4] Bulletin V, of the U. S. National Museum, Washington, D. C., 1876.

Specimens were obtained by the Expedition at Nassau and Clarence Harbor in June and July, 1903.

Family RHYPTICIDÆ (Soap Fishes).

RHYPTICUS BISTRISPINOSUS (Mitchill) (Soap Fish).

Plate LII.

A curious fish, named on account of the soapy or oily feeling of the smooth skin. Found along the south Atlantic coast of the United States from Charleston to Pensacola, straying northward to coast of New England. Obtained by the Expedition at Nassau and Green Cay in June and July, 1903.

Family KYPHOSIDÆ (Sea Chubs).

KYPHOSUS SECTATRIX (Linnæus) (Bermuda Chub).

The "rudder-fish," "chub," or "chopa blanca," as it is variously called, occurs in the open ocean from the West Indies northward to Cape Cod, and eastward to the Canary Islands. It is observed following vessels, probably for the food thrown overboard, and is often seen around the rudder, from which habit is derived one of its common names.

Obtained by the Expedition at N. Lat. 31° 13′, W. Lon. 74°, on June 13, 1903.

Family HÆMULONIDÆ (Grunts).

BATHYSTOMA AUROLINEATUM (Cuvier and Valenciennes) (Jeniguano).

One of the smaller species of grunts, occurring throughout the West Indies. Obtained by steamer *Albatross* at Abaco Island, April, 1886.

BATHYSTOMA RIMATOR (Jordan and Swain) (Tom Tate or Red-mouthed Grunt).

This grunt occurs in the Atlantic from Cape Hatteras to Trinidad. It is one of the most abundant of the food-fishes about Charleston Harbor. Obtained by the Expedition at Clarence Harbor, July 14, 1903.

HÆMULON ALBUM Cuvier and Valenciennes (Margate Fish).

This is one of the most important and highly esteemed food-fishes of the West Indies, the Florida Keys, the Bahamas and Bermuda. It grows to a length of 2 feet, and is more or less abundant. Numerous specimens were observed and captured by the Expedition in the various places visited, and the fish was always a welcome addition to the mess.

HÆMULON CARBONARIUM Poey (Ronco Carbonero).

A smaller species than the *H. album,* seldom exceeding 10 inches in length, but having some value as a food-fish, especially around Cuba, where it is found in abundance. It occurs in much smaller quantities in the rest of the West Indies, the Bermudas and Brazil. Several specimens were secured at Nassau by the steamer *Albatross* in April, 1886.

HÆMULON FLAVOLINEATUM (Desmarest) (Open-mouthed Grunt).

This is an exceedingly well-marked species, reaching a foot in length and being regarded as a good food-fish. It is common throughout the West Indies; ranges from Florida Keys south to Brazil, being found in greatest quantities about Porto Rico. Specimens were obtained at Nassau market and Abaco by the steamer *Albatross* in March, 1886. Other names by which this species is known are "French grunt" and "ronco condenado."

HÆMULON MELANURUM (Linnæus) (Black-tail Grunt).

This grunt is a good food-fish. It reaches a length of 1 foot and is common to the West Indies. Collected by me in the Nassau market, June, 1903.

HÆMULON PLUMIERI (Lacépède) (Common Grunt).

This is one of the most abundant and highly prized of the smaller varieties of food-fishes found throughout the West Indies, Florida Keys, Bahama Islands and other nearby localities. It grows to a length of 1 foot or more, but the average size of those found in the markets is much less. Obtained by the Expedition at Nassau in June, 1903.

HÆMULON SCIURUS (Shaw) (Yellow Grunt).

A handsome grunt, also known as "squirrel grunt." It grows to a length of 18 inches, but found in the markets much smaller. Found throughout the West Indies, Florida Keys, Bahamas and Bermuda.

BRACHYGENYS CHRYSARGYREUS (Günther) (Small-mouthed Grunt).

A little fish reaching but 6 inches in length. Common at Key West and Havana. The steamer *Albatross* obtained it at Abaco in 1886.

ANISOTREMUS VIRGINICUS (Linnæus) (Pork-fish).

Plate LIV.

A very good food-fish, known also as "sisi," reaching a length of 1 foot and ranging from Florida to Brazil; found frequently in the West Indies.

Secured by the Expedition at Nassau, July 2, 1903. Named for the Virgin Islands, where the fish is common, and not for Virginia, where it is seldom if ever found.

Family LUTJANIDÆ (Snappers).

Lutjanus analis (Cuvier and Valenciennes) (Mutton Fish).

A large, handsome food-fish, often sold as red snapper, occurring on the fishing banks of the West Indian waters, Florida and the Bahamas. Obtained at Nassau by the steamer *Albatross*. Observed in the markets at the time of our visit.

Catesby says: "For the excellence of its taste it is in greater esteem than any other at the Bahama Islands."

Lutjanus apodus (Walbaum) (Schoolmaster).

Grows to a weight of 8 pounds. An attractive fish, used for food. Common to Bahama, Florida and the West Indies generally.

Lutjanus buccanella (Cuvier and Valenciennes) (Black-finned Snapper).

Occurring in the West Indies; taken in deep water. Obtained by the steamer *Albatross* at Nassau in 1886.

Lutjanus griseus (Linnæus) (Gray Snapper).

This is one of the commonest and best food-fishes of the West Indian fauna. It is known as "mangrove snapper," attains a length of three feet (18 lbs.), and is found in the Bahamas, Bermuda, Florida and the West Indies.

Lutjanus mahogoni (Cuvier and Valenciennes) (Mahogoni Snapper).

One of the smaller species of snapper, found in the West Indies, etc. Observed and collected by the Expedition in Nassau market during June and July, 1903.

Lutjanus synagris (Linnæus) (Red-tailed Snapper).

One of the most abundant of the snappers, rarely exceeding a foot in length, chiefly inhabiting shallow waters. A food-fish of importance about Havana, occurring there in great numbers, but a little less abundantly found from Tampa to Brazil. Specimens were obtained by the exposition at Nassau, July 20, 1903.

Ocyurus chrysurus (Bloch) (Yellow-tailed Snapper).

A delicious and abundant food-fish ranging from southern Florida to Brazil, and throughout the West Indies. It grows to a length of 2 feet and possesses some merit as a game-fish. The steamer *Albatross* collected several specimens in April, 1886. Observed and collected by the Expedition in Nassau market during June and July, 1903.

Apsilus dentatus Guichenot (Arnillo).

This is a handsome fish reaching a foot in length and having some value as food. It is found in the West Indies, being rather common about Cuba. A specimen was taken by the Expedition at Powells Point, Eleuthera, July 8, 1903.

Family SPARIDÆ (Porgies).

Diplodus argenteus (Cuvier and Valenciennes) (Silvery Sargo).

Found in the West Indies and along the coast from Florida and the Bermudas southward to Argentina. One specimen was secured by the Expedition at Nassau, June 20, 1903.

Calamus calamus (Cuvier and Valenciennes) (Saucer-eye Porgy).

This fish reaches a length of 1 foot and besides being excellent eating, furnishes some sport in its capture, being considered a rather good game-fish by many. It is found throughout the West Indies and northward among the Florida Keys. The steamer *Albatross* collected several specimens at Nassau in April, 1886.

Calamus leucosteus Jordan and Gilbert (White-boned Porgy).

A good food-fish reaching a length of 1 foot and obtained heretofore only at the markets of Charleston, S. C. It was secured by the steamer *Albatross* at the Nassau market in April, 1886.

Calamus penna (Cuvier and Valenciennes) (Sheepshead Porgy).

Like the rest of the species this is valued as food. It is very common from southern Florida to Brazil and is known also in the West Indies. A specimen was obtained by the steamer *Albatross* at the Nassau market in April, 1886.

A. HOEN & CO., Lith

Anisotremus virginicus (Linnaeus).
PORK FISH
ABOUT 2/3 NATURAL SIZE

A. H. BALDWIN
ad nat. del.

CALAMUS BAJONADO (Bloch and Schneider) (Jolt-head Porgy).

This is the largest of the porgies, reaching a size of 2 feet and a weight of ten pounds. It is also the most abundant species of this genus and the most important as a food-fish. Found in abundance throughout the West Indies and north to the Florida Keys. Taken by the Expedition at Nassau, June 22, 1903.

Family GERRIDÆ (Silver Jennies).

GERRES BRASILIANUS (Cuvier and Valenciennes) (Patao).

Found from Cuba to Brazil, and ranking as a good food-fish wherever it is abundant. It reaches a foot in length and is generally common. Collected by the Expedition at Nassau, June 18, 1903.

GERRES CINEREUS (Walbaum) (Broad Shad).

This is one of the largest members of the family *Gerridæ*, reaching a length of more than a foot, and has considerable value as a food-fish. It is common to both coasts of tropical America, north to Florida and to Lower California. Obtained by seines and other nets. Common in the market at Nassau. Obtained by the Expedition at Spanish Wells and Clarence Harbor during July, 1903.

EUCINOSTOMUS GULA (Cuvier and Valenciennes) (Silver Jenny).

This is a common species from the coasts of Carolina to Brazil. It grows to a length of six inches and is chiefly valuable as bait. Obtained by the Expedition at Spanish Wells, Watlings Island and Clarence Harbor, during July, 1903.

EUCINOSTOMUS LEFROYI Goode (Long-boned Shad).

A bait fish, reaching a length of 8 inches. Common from Bermuda westward to Florida, and southward throughout the West Indies. Taken by the Expedition at Spanish Wells, the Current, and Clarence Harbor during July, 1903.

Family PRIACANTHIDÆ (Catalufas).

PRIACANTHUS CRUENTATUS (Lacépède) (Big-eye).

This fish is known in Havana as the "catalufa," and is a common food-fish in that market. It is found throughout the West Indies, ranging across the Atlantic to St. Helena and the Canaries. Obtained by the steamer *Albatross* at Rum Cay.

PRIACANTHUS ARENATUS Cuvier and Valenciennes (Catalufa).

Tropical Atlantic, straying northward in the Gulf Stream. Obtained by the steamer *Albatross* at Nassau.

Family MULLIDÆ (Surmullets).

UPENEUS MACULATUS (Bloch) (Goat Fish).

A very handsome, strikingly colored fish, abundant and valued as food. It occurs in the West Indies, and probably in Bermuda. Common in the Nassau market. Obtained by the Expedition at East End of Hog Island (Nassau harbor), along Eleuthera Island and at Clarence Harbor, where many young were seined during July, 1903.

UPENEUS MARTINICUS Cuvier and Valenciennes (Yellow Goat Fish).

This species grows to a length of one foot and is valued as food. It is found throughout the West Indies and north to Florida. The steamer *Albatross* collected it at Nassau in 1886.

Family CHÆTODONTIDÆ (Butterfly Fishes).

HOLACANTHUS TRICOLOR (Bloch) (Rock Beauty).

Plate LXI.

This striking fish inhabits the West Indies, and has been recorded from Bermuda. Numerous specimens were observed in the "Sea Gardens," near Nassau, during June, 1903, but none were taken.

POMACANTHUS ARCUATUS (Linnæus) (Black Angel Fish).

Length one and one-half to two feet. A handsome fish, but little valued as food. West Indies generally, occasionally straying northward to the middle Atlantic coast. Obtained by the Expedition at Nassau and Andros Island during June, 1903.

CHÆTODON OCELLATUS Bloch (Spanish Angel Fish).

West Indian fauna, straying northward. Observed among the coral heads in Nassau harbor. One of the beautiful fishes of the tropics. Obtained by the Expedition at Nassau during June, 1903.

CHÆTODON CAPISTRATUS Linnæus (French Angel Fish).

A beautiful tropical fish, of small size, abundant around the coral reefs of the West Indies. The *Chætodonts* are the butterflies of the warm seas. Obtained by the Expedition at Nassau, June 19, 1903.

ANGELICHTHYS CILIARIS (Linnæus) (Yellow Angel Fish).

One of the most beautiful of fishes, growing to a length of 18 inches. In his catalogue of Bermuda fishes Dr. Goode says: "The angel fish attains a weight of four pounds and as far surpasses all the other fishes of the region in its delicious flavor as in its lovely hues." It ranges through the West Indies. Common in the Nassau market and at other places in the Bahamas.

Family TEUTHIDIDÆ (Surgeon Fishes).

TEUTHIS BAHIANUS (Bloch and Schneider) (Ocean Tang).

This is the most important of the surgeon fishes on account of its large size (reaching a length of 1 foot), and its value as a food-fish. It is found in the West Indies and along the Atlantic coast from Key West to Bahia. Collected by the Expedition at Nassau during June and July, 1903.

TEUTHIS CÆRULEUS (Bloch and Schneider) (Blue Surgeon or Tang).
Plate LVI.

One of the commonest of the tangs in the West Indies, reaching a length of eight or ten inches and being used as food. Found also in the Bermudas and ranging from Key West to Bahia. Specimens were obtained by the Expedition at Nassau, Clarence Harbor and the east end of Hog Island during June and July, 1903.

TEUTHIS HEPATUS Linnæus (Common Tang).

This is the most abundant of the tangs, common in the West Indies and northward to Florida. Found occasionally as far north as Charleston and southward to Brazil. Several specimens collected by the Expedition at Clarence Harbor, July, 1903.

Family POMACENTRIDÆ (Demoiselles).

EUPOMACENTRUS LEUCOSTICTUS (Müller and Troschel) (Black Pilot).

An extremely handsome fish, attaining an approximate length of four or five inches and found in large numbers throughout the West Indies north to the western coast of Florida. Collected in July, 1903, at Clarence Harbor, Powells Point and the east end of Hog Island by the Expedition.

EUPOMACENTRUS FUSCUS (Cuvier and Valenciennes) (Maria Molle).

Found in the West Indies and among the coral reefs at Key West, ranging southward to the Brazilian coast, occurring in abundance almost throughout its entire range. Taken by the Expedition at Nassau, June 24, 1903.

EUPOMACENTRUS ADUSTUS (Troschel).

Attaining a length of three or four inches and occurring commonly about Cuba. Collected by the steamer *Albatross* at Nassau, April, 1886.

GLYPHISODON SAXATILIS (Linnæus) (Cow-pilot or Pintano).

A widely-distributed fish, occurring on both coasts of tropical America, ranging from Florida to Uruguay and Guaymas to Peru. It reaches a length of six inches and is abundant about the rocks and coral reefs at every point. Specimens were obtained by the Expedition at Nassau and Green Cay, July, 1903.

Family LABRIDÆ (Wrasses).

LACHNOLAIMUS MAXIMUS (Walbaum) (Hog Fish).

This is a common and attractive food-fish occurring throughout the West Indies and Bermudas, and ranging north to Key West. It attains a length of 3 feet and a weight of twenty pounds and is generally found in abundance about the coral reefs. A specimen was taken by the Expedition at Nassau during June and July, 1903, where it was common in the market.

HARPE RUFA (Linnæus) (Spanish Lady Fish).

A very attractive fish reaching a length of 2 feet. Found abundantly in the West Indies and ranging from Key West to Rio Janeiro. Obtained by the steamer *Albatross* in the market at Nassau.

NOVACULICHTHYS INFIRMUS (Bean) (Flexible Razor Fish).

Known heretofore only from Cozumel, Yucatan, but obtained by the steamer *Albatross* at Nassau, April, 1886.

XYRICHTHYS PSITTACUS (Linnæus) (Razor Fish).

A brilliantly colored fish found in the West Indies and from Charleston and Pensacola southward to Bahia. It reaches a length of 15 inches and is rather common. Obtained by the steamer *Albatross* at the Nassau market in April, 1886.

IRIDIO BIVITTATUS (Bloch) (Slippery Dick).

This is the smallest species of this genus, the average length being about 6 or 7 inches. It has an extensive range, occurring throughout the West Indies, and from North Carolina to Brazil, being exceedingly common everywhere among the rocks and reefs. A number of specimens were obtained by

the Expedition at Spanish Wells, Eleuthera Island, Clarence Harbor, and the east end of Hog Island during June and July, 1903.

IRIDIO GARNOTI (Cuvier and Valenciennes).

Reaches a length of 8 or 9 inches and is found in the West Indies. Obtained by the Expedition at Clarence Harbor, July 17, 1903.

IRIDIO MACULIPINNA (Müller and Troschel).

Found in the West Indies and ranging northward as far as Beaufort, N. C. Taken by the steamer *Albatross* at Nassau, April, 1886.

IRIDIO RADIATUS (Linnæus) (Pudding-wife).

Attains a length of 18 inches and ranks as the largest of the American species of *Iridio*. It is found abundantly in the West Indies and the Bermudas, ranging from Brazil to the Florida Keys. Several specimens were secured in the market at Nassau by the steamer *Albatross*, April 23, 1886.

CHLORICHTHYS BIFASCIATUS (Bloch).

A rather common fish found scattered throughout the West Indies. A number were collected by the Expedition at Clarence Harbor, July, 1903.

CHLORICHTHYS NITIDUS (Günther).

A fish reaching a length of 3 inches and being found in the West Indies. Taken by the Expedition from the Current, Eleuthera Island, and at Nassau and Clarence Harbor, during June and July, 1903.

Family SCARIDÆ (Parrot Fishes).

SPARISOMA AUROFRENATUM (Cuv. and Val.) (Gold-bridled Parrot Fish).

Plate LIX.

This is one of the most attractive of the parrot fishes, being well marked and highly colored, but like the other species of this genus has no great value as food. It reaches a length of 8 or 10 inches and is rather common throughout the West Indies. Collected by the Expedition at Nassau, June 24, 1903.

SPARISOMA VIRIDE (Bonnaterre) (Dark-green Parrot Fish).

Found in the West Indies and is generally common. It is one of the largest of the species, attaining a length of 2 feet, and is considered a food-fish at Porto Rico. A specimen was secured by the steamer *Albatross* in the market at Nassau, March, 1886.

Sparisoma distinctum (Poey) (Streaked Parrot Fish).

This species ranges throughout the West Indies, and was obtained by the Expedition in the Bahamas during June and July, 1903.

Sparisoma flavescens (Bloch and Schneider) (Mud Parrot).

One of the smaller of the parrot fishes, rarely exceeding a foot in length; plain in color; common from Key West to Rio Janeiro. Obtained by the Expedition in the Nassau market, June, 1903.

Sparisoma hoplomystax (Cope).

Occurs in the West Indies and from Key West to Bahia. It is very common throughout its whole range, being seined in large quantities by the Expedition at Clarence Harbor. A number of specimens were also obtained at Spanish Wells and the east end of Hog Island during July, 1903.

Sparisoma lorito Jordan and Swain (Loro).

Found in the West Indies and used as food by the Porto Ricans. It was collected by the Expedition at Nassau in June, 1903.

Scarus cæruleus (Bloch) (Blue Parrot Fish).

Widely and abundantly distributed throughout the West Indies northward as far as Chesapeake Bay. It reaches a length of 2 or 3 feet and a weight of twenty pounds, its large size making it the most important of the parrot fishes, although it is not highly valued as food. A specimen was taken opposite Mangrove Cay by the Expedition, June 27, 1903. Common.

Scarus croicensis (Bloch) (Bullon).

One of the smaller of the species, its length rarely exceeding 6 or 7 inches. It is very common throughout the West Indies and ranges north to Key West. Large numbers were obtained at Spanish Wells, Powells Point and Clarence Harbor by the Expedition during July, 1903.

Scarus tæniopterus Desmarest (Ribbon-finned Parrot Fish).

Occurs in the West Indies and is rather numerous. It reaches a length of about 10 inches. Collected by the Expedition in the Bahamas during June and July, 1903.

A. HOEN & CO., Lith.

Pterophryne histrio (Linnaeus)
MOUSE FISH: Sargassum Fish
TWICE NATURAL SIZE

A. H. BALDWIN
ad nat. del

CRYPTOTOMUS RETRACTUS (Poey).

Found in the West Indies and north to Pensacola. Several specimens obtained by the Expedition from the Current, Eleuthera, and at Clarence Harbor during July, 1903.

Family ZEIDÆ (John Dories).

ZENION HOLOLEPIS (Goode and Bean).

Taken by the steamer *Albatross* off coast of Yucatan and on Little Bahama Bank. Described and figured by Goode and Bean in Oceanic Ichthyology, 1896.

Family SCORPÆNIDÆ (Rock Fishes).

SCORPÆNA PLUMIERI Bloch (Rascacio).

A handsome but valueless species, more or less common to the south Atlantic coast of the United States, the West Indies, and recorded from Bermuda. The steamer *Albatross* obtained it at Nassau. At Key West this fish is called "poison toad."

SCORPÆNA BRASILIENSIS Cuvier and Valenciennes (Scorpion Fish).

Found from Charleston to Rio Janeiro. One specimen taken by the Expedition at the Current, July 5, 1903.

SCORPÆNA GRANDICORNIS Cuvier and Valenciennes (Lion Fish).

A strikingly handsome fish occurring around the Florida Keys and southward throughout the West Indies to Brazil. The steamer *Albatross* obtained it at Abaco, April, 1886.

The fishes of this genus are known at Key West as "poison toads" on account of the painful wounds they inflict with their spines.

Family CEPHALACANTHIDÆ (Flying Gurnards).

CEPHALACANTHUS VOLITANS (Linnæus) (Flying Gurnard).
Plate LX.

A beautifully colored species, of odd form, known in some of the West Indian islands as bat-fish. Found on both coasts of the Atlantic Ocean, ranging north to Newfoundland and south to Rio Janeiro. Recorded from Woods Holl, Massachusetts, Bermuda, Key West and various West Indian islands. Obtained by the Expedition at Nassau during June, 1903. The color sketch by Mr. Baldwin gives one a good idea of the appearance of the fish in life and especially of its handsome pectoral fins. To show this fin to advantage the

artist took the liberty to draw it down in an unnatural position; the eye as shown in the picture is rather too small.

Family MALACANTHIDÆ (Blanquillos).

MALACANTHUS PLUMIERI (Bloch) (Sand Fish).

This species grows to a length of 15 inches or more; it is rather common in the West Indies and used as food. Obtained by the Expedition at Green Cay and Clarence Harbor during July, 1903.

Family DACTYLOSCOPIDÆ (Little Star-gazers).

DACTYLOSCOPUS TRIDIGITATUS Gill (Fingered Star-gazer).

This interesting little fish is found in the West Indies and north to Key West and the Bahamas. Two specimens were obtained by the Expedition at the Current, July 5, 1903.

Family GOBIIDÆ (Gobies).

GOBIUS GLAUCOFRÆNUM (Gill) (Bridled Goby).

Heretofore recorded from the Florida Keys. Twenty-five specimens were obtained by the Expedition in the oyster dredge off Governors Harbor, Eleuthera Island, July 7, 1903, in five fathoms of water.

GOBIUS SOPORATOR Cuvier and Valenciennes (Sleeper or Caiman Goby).

This species is generally abundant in tropical seas of both Atlantic and Pacific oceans. Found in the shallow waters of shores and ditches, hiding under stones. Specimens were obtained by the Expedition at Salt Key, near Nassau, and at Powells Point, Eleuthera, during June and July, 1903.

GARMANNIA HEMIGYMNA (Eigenmann and Eigenmann) (Half-naked Goby).

This highly interesting goby, heretofore indefinitely ascribed to the West Indies, was taken by the Expedition in an oyster dredge on the north side of Green Cay, in about five fathoms of water, June 30, 1903, five examples, measuring from five-eighths to seven-eighths of an inch in length, being captured.

Family GOBIESOCIDÆ (Clinging Gobies).

GOBIESOX CEPHALUS Lacépède (Cling Fish).

Obtained by the Expedition at Green Cay, in the oyster dredge, in five fathoms of water.

GOBIESOX ILERES Jordan and Bollman.

Collection of C. L. Edwards, Green Turtle Cay, 1888. The single specimen taken was described in Proc. U. S. Nat. Museum, XI, 1888, p. 552.

Family ECHENEIDÆ (Remoras).

ECHENEIS NAUCRATEOIDES Zuiew (Sucking Fish).

This interesting fish ranges from the coast of Massachusetts to the West Indies, being common southward. It is also found in the waters of Bermuda, usually attached to sharks. Obtained by the Expedition at Gregory Town, Eleuthera, July, 1903, where they were first noticed by the side of the vessel eating offal. Numerous examples, captured by hook and line.

Family BLENNIIDÆ (Blennies).

LABRISOMUS NUCHIPINNIS (Quoy and Gaimard) (Molly Miller).

Common in rock pools of the West Indies. The steamer *Albatross* obtained this species at Abaco, New Providence and Watlings Island during March and April, 1886. Recorded from Bermuda.

MALACOCTENUS MOOREI Evermann and Marsh (Combed Blenny).

This species was described in 1899 from a specimen obtained in Porto Rico. It has since been collected in the Tortugas Archipelago by Dr. J. C. Thompson, U. S. N., at Key West by Bean and King, and obtained by the Bahama Expedition at Powells Point and Clarence Harbor during July, 1903.

MALACOCTENUS VARIUS (Poey) (Variegated Blenny).

An interesting little fish recorded by Poey from Cuba, and obtained by the steamer *Albatross* at Nassau, March, 1886.

MALACOCTENUS LUGUBRIS (Poey) (Dismal Blenny).

Described from Cuban specimens; obtained by the steamer *Albatross* at Nassau, March, 1886.

MALACOCTENUS OCELLATUS (Steindachner) (Ocellated Blenny).

Clinus ocellatus Steindachner. Ichth. Beitr., V, 1876, p. 182. Bahama Islands. Definite locality not given.

MALACOCTENUS BIGUTTATUS (Cope).

Described under the name of *Labrisomus biguttatus* in Trans. Amer. Philos. Soc., Phila., 1873, p. 473, from a specimen taken along New Providence.

AUCHENOPTERUS AFFINIS (Steindachner) (Nape-finned Blenny).

Heretofore recorded from St. Thomas and Key West; obtained by the Expedition at Governors Harbor, Eleuthera.

STATHMONOTUS HEMPHILLII Bean (Hemphill's Blenny).

Heretofore known only from two specimens taken at Key West; one example of this interesting form was obtained by the Expedition on the shore of Hog Island, near Nassau, June 18, 1903.

Family OPHIDIIDÆ (Cusk Eels).

OPHIDIUM sp. (Cusk Eel).

The steamer *Albatross* obtained a specimen at Abaco.

Family FIERASFERIDÆ (Pearl Fishes).

FIERASFER AFFINIS (Günther) (Pearl Fish).

This interesting species takes its common name from the habit of resorting to the shells of the pearl oyster. It has been recorded from Key Biscayne, Florida, the Tortugas. Cape Florida, New Providence, and on the west coast at Panama and Lower California. The *Albatross* collected it at Nassau, 1886, and the U. S. National Museum has recently received specimens collected by Dr. Hubert L. Clark at Jamaica.

Family PLEURONECTIDÆ (Flounders).

PLATOPHRYS MACULIFER (Poey) (Spotted Flounder).

This little flounder was found by the Expedition in considerable numbers on the beach of east end of Hog Island, the Current, Eleuthera, and in Clarence Harbor, July, 1903. Taken in the seine. Poey described it from Cuba.

PLATOPHRYS LUNATUS (Linnæus) (Peacock Flounder).

A specimen 14 inches long of this beautiful flounder was taken by C. L. Edwards at Green Turtle Cay in 1888.

PLATOPHRYS OCELLATUS (Agassiz) (Ocellated Flounder).

Sandy shores of the Atlantic coast from New England to Brazil.

PLATOPHRYS sp. (Spotted Flounder).

A handsome specimen, 5½ inches long, of a flounder referable to this genus was taken by the Expedition at Tarpum Bay, July 7, 1903.

Citharicthys spilopterus Günther (Whiff).

A small fish abundant along the shores of the western Atlantic from South Carolina to Brazil. Obtained by the Expedition along Eleuthera, the Current, July 5, 1903.

Syacium micrurum Ranzani (Small Flounder).

This species belongs to the West Indian fauna. It was obtained by the Expedition in Clarence Harbor, July 15, 1903.

Family SOLEIDÆ (Soles).

Achirus inscriptus Gosse.

Taken by C. L. Edwards at Green Turtle Cay in 1888.

Family AULOSTOMIDÆ (Trumpet-fishes).

Aulostomus maculatus Valenciennes (Trumpet Fish).

This interesting fish ranges from Bermuda and Florida southward. Several specimens were obtained by the Expedition at Clarence Harbor, July 14 and 17, 1903. Called "stalk-fish" in the Bahamas. The life colors of this fish are very pretty, forming as they do lines of cream, chocolate and black horizontal stripes. There are also numerous pearl-colored spots on the body.

Family SYNGNATHIDÆ (Pipe-fishes).

Siphostoma albirostre (Heckel) (Pipe Fish).

This species has been recorded from the coral reefs of the West Indies, ranging from Florida to Bahia. Obtained by the steamer *Albatross* at Abaco, Watlings Island and New Providence.

Siphostoma pelagicum (Osbeck) (Pipe-fish).

Tropical parts of the Atlantic. Obtained by the Expedition at Clarence Harbor, July 14, 1903.

Siphostoma rousseau (Kaup) (Pipe Fish).

West Indies, known from St. Lucia and Martinique. Obtained by the Expedition between Nassau and Elbow Key, July, 1903, in seaweed taken by dip-net.

Corythroichthys cayorum Evermann and Kendall (Pipe-fish).

Described from Key West; taken by the Expedition at Powells Point and Clarence Harbor, July, 1903.

Family HIPPOCAMPIDÆ (Sea Horses).

HIPPOCAMPUS PUNCTULATUS Guichenot (Sea Horse).

Tropical parts of the Atlantic, common in the West Indies. One specimen collected by the Expedition at Governors Harbor, July 7, 1903.

Family BALISTIDÆ (Trigger-fishes).

BALISTES VETULA Linnæus (Old-wife).

This important species is common in the tropical parts of the Atlantic, throughout the West Indies and north to Florida, Bahama and Bermuda. It is a showy fish in life and the young, which are quite numerous around the coral heads of the Bahamas, add much to the beauty of the fish life seen there.

Collected and observed by the Expedition in considerable numbers at various points visited during June and July, 1903. Common in the Nassau market.

BALISTES CAROLINENSIS Gmelin (Turbot).

Found in the tropical parts of the Atlantic, ranging northward in the Gulf Stream to the New England coast. Common in the Mediterranean. The flesh is eaten and the skin is used for polishing purposes. "Trigger-fish" and "leather-jacket" are other common names for this species. Several young specimens were taken by the Expedition in the Gulf weed north of Abaco during July, 1903.

CANTHIDERMIS MACULATUS (Bloch) (Rough-skinned Turbot).

So far as the records go this is a rare species. It inhabits the open ocean of the West Indies and has received the name of "ocean turbot." One specimen was obtained by the Expedition in floating gulf weed about sixty miles north of Abaco during July, 1903. Young, 1⅝ inches long.

Family MONACANTHIDÆ (File-fishes).

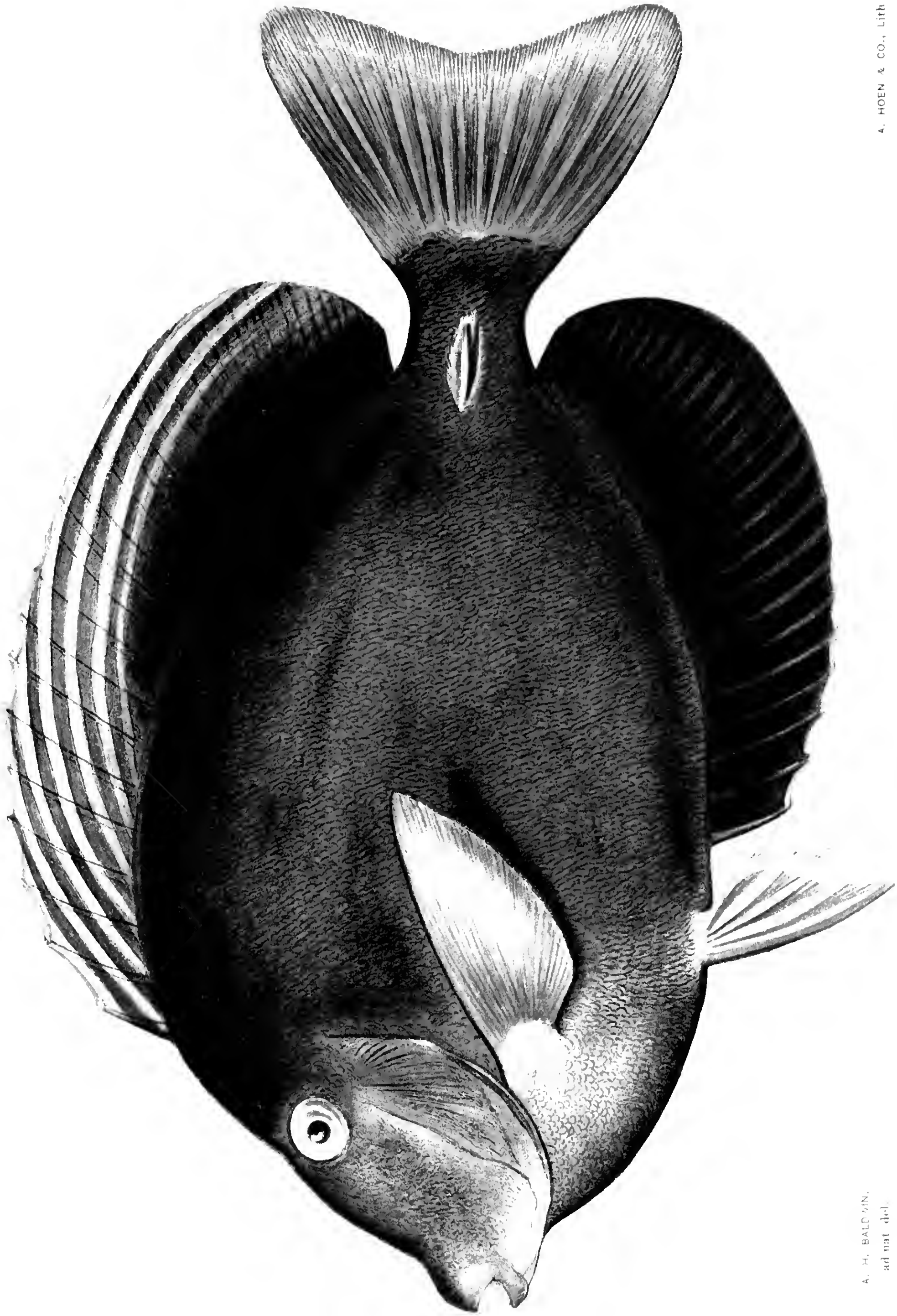
MONACANTHUS SPILONOTUS Cope (File-fish).

The habitat of this species is recorded as Gulf of Mexico. We obtained it on the edge of the Gulf Stream, June 6, 1903, not far from Cape Hatteras, and July 15 at Clarence Harbor, and east end of Hog Island, July 20, 1903. Common in the latter places.

CANTHERINES PULLUS (Ranzani) (Lija Colorada).

West Indies and Brazil, north to southern Florida. Obtained by the steamer *Albatross* at Nassau, April 23, 1886.

A. HOEN & CO., Lith.



Teuthis caeruleus (Bloch & Schneider)

BLUE TANG; Surgeon Fish

ABOUT 4/5 NATURAL SIZE

A. H. BALDWIN.
ad nat. del.

ALUTERA SCRIPTA (Osbeck) (Unicorn Fish).

This curious fish, also known as "file-fish," was observed by Catesby in the Bahamas, and by Goode in Bermuda, where it was so uncommon (1872) that it did not have a common name. It grows to a length of 2 or 3 feet. Observed by us at Nassau during June and July, 1903.

Family OSTRACIONTIDÆ (Trunk-fishes).

LACTOPHRYS BICAUDALIS Linnæus (Shell-fish).

This curious, showy fish is common to the West Indies. It was present in the Nassau market and is more or less esteemed as food. Like other members of the genus, it is sold to curiosity hunters.

LACTOPHRYS TRICORNIS Linnæus (Horn-fish).

This species is rather common from the coast of North Carolina to Brazil. It is the "cow-fish" of Bermuda, "cuckold" of Jamaica," and "toro" of the Cubans. The fish reaches a length of 18 inches and is much esteemed as food. Obtained by the Expedition in Nassau market, June 20, 1903. The steamer *Albatross* collected it at Nassau and Abaco in 1886.

LACTOPHRYS TRIGONUS Linnæus (Trunk-fish).

West Indies north to Key West, and straying to the coast of Massachusetts. Four specimens were collected by the Expedition at Clarence Harbor, July 14, 1903. The steamer *Albatross* obtained a specimen at Rum Cay, July, 1903.

Family TETRODONTIDÆ (Puffers).

SPHEROIDES SPENGLERI (Bloch) (Swell-toad).

This fish, known also as "puffer" and "tambor," is found from Florida and Texas throughout the West Indies to Rio Janeiro and eastward to the Canaries and Madeiras. Recorded by Mr. Goode from Bermuda. Obtained by the Expedition at the Current, Powells Point, Clarence Harbor and at east end of Hog Island, July, 1903.

Family DIODONTIDÆ (Porcupine Fishes).

DIODON HYSTRIX Linnæus (Porcupine Fish).

This species is widely distributed, being found in tropical seas, everywhere more or less common. Its chief value is as a curiosity, and it is sold by dealers of marine curios. Many dried and inflated skins were seen in the shops at Nassau, ranging in length from 1 to 2 feet. In Bermuda, Mr. Goode says,

it is highly prized by curiosity hunters, but never eaten. He records the name "sea hedgehog," and if I remember correctly, the name "edgehog" is used in the Bahamas.

DIODON HOLACANTHUS Linnæus (Smaller Porcupine Fish).

Found in warm seas generally. Very similar to *D. hystrix,* and it seems to us probably the young of that species. Numerous specimens were obtained by the Expedition at Clarence Harbor and at the east end of Hog Island, July, 1903.

CHILOMYCTERUS SPINOSUS (Linnæus) (Burr-fish).

Under this we would place *C. schœpfi* of Walbaum and *C. geometricus* (Bloch and Schneider). Habitat Atlantic coast of America from Cape Cod to Brazil: Gulf of Mexico to Bermuda. Taken by the steamer *Albatross* at Nassau, April 10, 1886.

Family ANTENNARIIDÆ (Anglers).

ANTENNARIUS PRINCIPIS (Cuvier and Valenciennes) (Black Angler).

West Indian fauna. Named for Prince Maurice of Nassau, its discoverer. A very small example of this interesting little fish was picked out of some grass on the beach at Golding Key, Andros Island, June 27, 1903, by Mr. C. A. Shore, of the botanical party. Its general color is black; spinous dorsals and tips of pectorals whitish; a white blotch on back before rays of dorsal, and upper edge of caudal peduncle whitish.

ANTENNARIUS NUTTINGI Garman.

Great Bahama Banks. Expedition State University of Iowa, 1893.

PTEROPHRYNE HISTRIO (Linnæus) (Mouse Fish).

Plate LV.

This curiously shaped fish, known also as "sargassum-fish," and "harlequin-fish," was found by the Expedition in floating seaweed (sargassum) in and near the Gulf Stream from off Cape Hatteras south to Andros Island. Quite a number were taken in dip-nets as the vessel slowly sailed along; they ranged in length from one-half to three inches. Probably fifty examples were captured by different members of the party, who saved them as curiosities. Twenty were preserved by the writer for the National Museum.

The colored sketch by Mr. Baldwin is a very good representation of the fish in life. The pectorals are not quite correctly drawn, the rays should be more slender and at least ten in number. One of the larger examples has eleven rays in the pectoral.

Family OGCOCEPHALIDÆ (Bat-Fishes).

OGOCEPHALUS RADIATUS (Mitchill).

Great Bahama Banks. Expedition of State University of Iowa, 1893.

BATRACHIANS AND LAND REPTILES OF THE BAHAMA ISLANDS

BATRACHIANS AND LAND REPTILES OF THE BAHAMA ISLANDS

BY

LEONHARD STEJNEGER,

Curator, Division of Reptiles and Batrachians, U. S. National Museum.[1]

INTRODUCTION.

The present account of the terrestrial herpetological fauna of the Bahama Islands is the result of a request by Dr. George B. Shattuck for a general herpetological sketch of the archipelago from a zoogeographical standpoint. Realizing the inadequacy of the material hitherto gathered for an attempt of this kind, I undertook the writing of this article with considerable reluctance. The batrachians and reptiles of the Bahamas are only very imperfectly known, as collections have been made in not more than fifteen of the numerous islands which compose the archipelago. Moreover, the islands from which reptiles have been recorded are very unequally explored. Thus we know now fourteen species from the small island of New Providence, while from the big island of Inagua only five species are recorded. As a matter of fact, not a single island has been thoroughly explored, and the circumstance that New Providence stands out with such a preponderance of species is only due to the fact that practically everybody who has collected in the archipelago visited that island and spent most of the time there. Under such circumstances generalizations must be made and accepted with the utmost caution, and it should be distinctly understood that whatever of the kind may be submitted in the following account must be received as preliminary statements only, subject to later revision when we shall know the Bahama land fauna better.

The Director of the Expedition of the Geographical Society of Baltimore had hoped to remedy this unfortunate state of affairs, but owing to unfavor-

[1] By permission of the Secretary of the Smithsonian Institution.

able sailing conditions the exploration of the more southerly islands of the group, such as Inagua, Caicos, and Turks Islands, which are so essential to a full understanding of the zoogeographical relations of the Bahamas, was not practicable. Mr. J. H. Riley, the member of the Expedition whose duty it was to attend to the reptiles, was obliged to devote his energies to birds and mammals as well, and owing to the fact that his time on shore was frequently limited, the reptiles did not receive as much attention as was expected. Mr. Riley, nevertheless, secured some very interesting specimens, such as the *Cyclura bæolopha* Cope the new *Cyclura rileyi* Stejneger, of which he brought home a fine series.

During the summer of 1904, some months after this paper had been sent to the editor, Mr. Thomas Barbour, of the Museum of Comparative Zoology in Cambridge, Mass., together with several other gentlemen, made extensive collections on a number of the northern islands and keys, some of which had not been explored herpetologically before. His paper [2] contains many valuable additions to our knowledge, and it is extremely unfortunate that more extensive references to it could not be made in the following account.

SYSTEMATIC AND NOMENCLATURAL NOTES.

Before approaching the zoogeographical problems, it will be necessary to discuss the systematic as well as the nomenclatural status of a number of species occurring in or said to occur in the archipelago.

BATRACHIANS.

Hyla septentrionalis Boulenger.

Hyla septentrionalis Boulenger, 1882, Cat. Batr. Sal. Brit. Mus., p. 368.

This name must be dated from Boulenger, as both Schlegel's *Hyla septentrionalis* of 1837, and Tschudi's *Dendrohyas septentrionalis* of 1838, are absolute *nomina nuda*. Should Cope's *Trachycephalus insulsus* [3] really be identical with the present species, which I greatly doubt, this name would take precedence, as *Hyla marmorata*, based upon Bibron's *Trachycephalus marmoratus* [4] is antedated by *Hyla marmorata* Daudin, 1803.

[2] Barbour, Thomas, Batrachia and Reptilia from the Bahamas, Bull. Mus. Comp. Zool. Cambridge, xlvi, No. 3, Dec., 1904, pp. 55-61.

[3] Proc. Acad. Nat. Sci. Phila., 1863, p. 43.

[4] Hist. Fis. Pol. Nat. Cuba, Zool., iv, Rept., x, 1834, p. 138.

ELEUTHERODACTYLUS RICORDII (Duméril and Bibron).

Hylodes ricordii Duméril and Bibron, 1841, Erpét. Gén., vol. viii, p. 623.

This is commonly known as *Hylodes ricordii*. For the use of the generic term see my Herpetology of Porto Rico.[5] I have not been able to examine Bahama specimens of this species and am thus unable to express an opinion regarding their identity with specimens from Cuba and Florida. I have compared specimens from the two latter localities and was unable to find any differences.

REPTILES.

LIZARDS.

SPHÆRODACTYLUS NOTATUS Baird.

Sphærodactylus notatus Baird, 1858, Proc. Acad. Nat. Sci. Phila., p. 254.

I have compared Bahama with Cuban, Santo Domingan and Florida examples and found no differences.

SPHÆRODACTYLUS CORTICOLUS Garman.

Sphærodactylus corticolus Garman, 1888, Bull. Essex Inst., vol. xx, p. 11.

Originally described from Rum Cay, but the U. S. National Museum has it also from Watlings Island. This species appears to have its nearest relative in Santo Domingo, as the specimens which Garman has recorded from Samana, Santo Domingo, as *S. nigropunctatus*[6] must be rather closely allied. Their dorsal scales may be smaller, but they are described as being keeled.

SPHÆRODACTYLUS ASPER Garman.

Sphærodactylus asper Garman, 1888, Bull. Essex Inst., vol. xx, p. 13.

Thus far only known from Andros. Garman in describing this species suggests relationship with his *S. picturatus*. This species is recorded from Haiti and also from Cuba.

SPHÆRODACTYLUS DECORATUS Garman.

Sphærodactylus decoratus Garman, 1888, Bull. Essex Inst., vol. xx, p. 12.

One of the species with granular dorsals and broad blackish bands across the back and tail. The related species occur both in Haiti and in Cuba, but

[5] Rep. U. S. Nat. Mus. for 1902, publ. 1904, p. 582.

[6] Bull. Essex Inst., xix, 1887, p. 18.

their exact systematic and geographical limits are as yet not very clearly made out. In the Bahamas the species thus far has been found only on Rum Cay.

MABUYA SLOANII (Daudin) (?).

Scincus sloanii Daudin, 1803, Hist. Nat. Rept., vol. iv, p. 287.

Cope is the only author to record a skink from the Bahamas. It was brought from Turks Islands by Professor Adrian J. Ebell and was first enumerated by Cope as *M. cepedei*, but afterwards as *M. agilis*. This name belongs to a South American species, however, and undoubtedly is inapplicable to the Turks Islands slippery-back. As I have not seen the specimen I can not be absolutely certain of its identity, but the chances are that it is *M. sloanii* which occurs in Haiti and Porto Rico.

AMEIVA THORACICA Cope.

Ameiva thoracica Cope, 1862, Proc. Acad. Nat. Sci. Phila., p. 64.

Most nearly related to the Cuban *A. auberi* Cope.

AMEIVA MAYNARDII Garman.

Ameiva maynardii Garman, 1888, Bull. Essex Inst., vol. xx, p. 10.

This, on the other hand, belongs to a different section of the genus which is only represented in Haiti and the island of St. Croix.

ANOLIS PORCATUS Gray.

Anolis porcatus Gray, 1840, Ann. Mag. Nat. Hist., p. 112.

As has been shown long ago by Garman, there are very good reasons for separating the Cuban form under the above name from *Anolis carolinensis* Duméril and Bibron of the southern United States. The Bahama specimens are very close to the Cuban ones, though I have a strong suspicion that eventually they may be found to be separable. So much is certain, however, that the Bahama form is in no way directly connected with *A. carolinensis*, but that its relationship is with Gray's *A. porcatus*. Whether Cope's *A. porcatus brunneus*, from Crooked Island, is a really distinguishable local form must remain undecided for the present because of lack of material.

A. HOEN & CO., Lith

Epinephelus maculosus (Cuvier & Valenciennes).

RED HIND

NATURAL SIZE

A. H. BALDWIN ad nat. del.

ANOLIS PULCHELLUS Duméril and Bibron (?).

Anolis pulchellus Duméril and Bibron, 1837, Erpét. Gén., vol. iv, p. 97.

A single specimen in the U. S. National Museum (No. 25651) seems to belong to this Porto Rican species. It was collected by the naturalists of the U. S. Fish Commission steamer *Fish-hawk*, during the expedition to Porto Rico of 1899, and was found in a bottle labeled "Nassau, New Providence, Dec. 25, 1898," containing specimens of *Anolis distichus* Cope and *A. sagrei* Duméril and Bibron. As no species of this group has been collected before in the Bahamas, and as the possibility of the accidental misplacement of a Porto Rican specimen is not excluded, no further reference to this species will be made at present.

ANOLIS SAGREI Duméril and Bibron.

Anolis sagrei Duméril and Bibron, 1837, Erpét. Gén., vol. iv, p. 149.
Anolis ordinatus Cope, 1864, Proc. Acad. Nat. Sci. Phila., p. 175.

The relative status of these names is uncertain. The former was originally described from Cuba by Duméril and Bibron. The latter was described by Cope from specimens in British Museum having no other locality than "West Indies," and Boulenger, with the types before him, regards them as identical.[7] Cope, in 1887, still maintains their distinctness, referring the specimens from Turks Islands to *A. ordinatus*, and those from New Providence and Abaco to *A. sagrei*.[8] Garman, in the same year, regards *A. ordinatus* as the Bahama variety of *A. sagrei*, recording specimens from New Providence and the Florida Keys.[9] He has apparently not examined specimens from Turks Islands, and it is quite possible, not to say probable, that these may differ from those of the northern islands, but it is highly dubious if in that case the name *A. ordinatus* is applicable to them. On the other hand, while I am at present unable to point out any structural characters separating the Bahama and Cuban specimens, there seems to be a constant difference in the color of the naked skin of the dewlap. In all the Cuban examples, whether preserved in alcohol or formalin, there is always a distinct trace of crimson, while in all the Bahama specimens before me this skin is blackish, indicating

[7] Cat. Liz. Brit. Mus., ii, 1885, p. 40.
[8] Proc. U. S. Nat. Mus., x, 1887, p. 436.
[9] Bull. Essex Inst., xix, 1887, p. 47, author's reprint, p. 23.

a color in life different from red.[10] From my own personal experience with the *Anoles* in Porto Rico I am inclined to attach great weight to the color of the dewlap, and I found it constant even in very closely allied species. I shall therefore follow Garman in calling the northern Bahama specimens *A. ordinatus*, those from Cuba *A. sagrei* and those from Turks Islands *Anolis* sp.?

Anolis leucophæus Garman.

Anolis leucophæus Garman, 1888, Bull. Essex Inst., vol. xx, p. 9.

Cope's *A. cinnamomeus* is six years younger than *A. leucophæus* of Garman, who informs me of their identity. He writes that he is in doubt whether *A. moorei* Cope is really distinct.

Cyclura cyclura (Cuvier).

Iguana cyclura Cuvier, Regne Anim., 2nd ed., ii, p. 45. (?).

No uncertainty exists concerning the status and relationships of the species *Cyclura baelopha* Cope, *C. carinata* Harlan, and *C. rileyi* Stejneger, respectively from Andros, Turks Islands and Watlings; they are easily distinguished *inter se* and from the species inhabiting the adjoining larger Antilles Cope's reference of an iguana from Cat Island to the typical species *Cyclura cyclura*, or *C. nubila* as he calls it,[11] is therefore highly dubious, but as the specimen upon which the record is made appears to be lost,[12] I am at present unable to settle the question.

Leiocephalus carinatus Gray.

Leiocephalus carinatus Gray, 1827, Phil. Mag., p. 208.

When describing *L. virescens*, the only other Bahama specimens of this group accessible to me were a few without definite locality collected by Bryant. Since then I have examined true *L. carinatus* from Andros, collected by Mr. Riley during the Expedition of the Geographical Society of Baltimore, and a specimen from Cat Island. It follows that *L. virescens* is a local form from

[10] Mr. Riley in his field notes speaks of a "black" *Anolis* "with an orange-colored throat frequenting old fences and bushes along the road and the more open woods." This is probably *A. ordinatus* Cope.

[11] Proc. U. S. Nat. Mus., x, 1887, p. 437.

[12] In the record book of the Division of Reptiles, U. S. Nat. Mus., a specimen from Cat Island is entered under No. 14576 as *Cyclura nubila*. The specimen so tagged is not a *Cyclura*, however, but *Leiocephalus carinatus* Gray.

Green Cay, characterized chiefly by the shortness of the fifth toe and the smallness of the interparietal.

Leiocephalus loxogrammus Cope.

Leiocephalus loxogrammus Cope, 1887, Proc. U. S. Nat. Mus., vol. x, p. 437.

Mr. Riley during the last Expedition obtained a young specimen from Watlings Island of this distinct species which hitherto was only known from Rum Cay, the type locality. It shows no tangible differences from the types.

SNAKES.

Leptotyphlops albifrons (Wagler).

Stenostoma albifrons Wagler, 1824, Serp. Brasil., p. 68.

Cope's identification of a blind snake from Watlings Island as *Stenostoma melanoterma,* described by himself from Paraguay, appears less startling if we accept Boulenger's verdict that the latter is a synonym of *L. albifrons* which is widely distributed over South America and Central America. The latter author also records specimens from Grenada and Antigua, among the Lesser Antilles. This species has not been found in Haiti as yet, but as this island is very imperfectly explored, no importance attaches to this negative evidence.

Typhlops lumbricalis (Linné).

Anguis lumbricalis Linné, 1758, Syst. Nat., 10th ed., i, p. 228.

The only specimen known from the Bahamas was taken on Abaco. It deviates slightly from the general type which is found in nearly all the West Indian islands, but whether it represents a depauperate form of this species or only an individual aberration cannot be determined from a single specimen.

Epicrates chrysogaster (Cope).

Homalogaster chrysogaster Cope, 1871, Proc. Am. Philos. Soc., vol. xi, p. 557.

As I have already pointed out in my Herpetology of Porto Rico,[13] *E. chrysogaster,* from Turks Islands, appears to merit separation from *E. fordii* (Günther), its near ally in Haiti. The latter has only 33 to 37 scale rows and 69 to 78 dorsal spots, while *E. chrysogaster* is said to have 43 scale rows and 54 dorsal spots.

[13] Rep. U. S. Nat. Mus. for 1902, p. 694.

EPICRATES STRIATUS (Fischer).

Homalochilus striatus Fischer, 1856, Abhandl. Nat. ver. Hamburg, Bd. iii, p. 102.

The big boa found on New Providence was described by Cope as distinct from the Haitian species and named *Homalochilus strigilatus*. A careful comparison of two specimens from the type locality, one of which was collected by Mr. Riley, with five specimens from Haiti and Santo Domingo, fails to discover any tangible differences in color or scutellation. It should be emphasized that the New Providence specimens show no approximation towards the Cuban *E. angulifer* Bibron, which there is no reason whatever for connecting trinominally with the Haitian species.

TROPIDOPHIS PARDALIS (Gundlach).

Boa pardalis Gundlach, 1840, Arch. Naturg., i, p. 359.

The generic name *Tropidophis* based by Bibron, in 1840, upon Schlegel's *Boa melanura,* antedates Gray's *Ungalia* by two years. This species was originally described from Cuba, but has hitherto been regarded as *T. maculata* (Bibron), also from Cuba. Mr. Barbour has now shown that it is the species with fewer ventrals which occurs in the Bahamas, unless indeed both are found there. On these points I am unable to form an opinion, as I have no material. The following remarks were penned before the receipt of Mr. Barbour's paper.

Cope[14] maintains the distinctness of his *Tropidophis hætiana,* asserting that in the latter "the scale rows are 29 and no interparietal plates, while in Cuban *T. maculata* the scales never exceed 25 rows and are usually 23," while the interparietals "are always present." These characters are not so constant as he seems to think, for Boulenger records a Cuban specimen in the British museum as having 27 scale rows and the U. S. National Museum has another (27455). On the other hand, Boulenger quotes a Santo Domingan specimen having only 25. Yet it may probably be said that the majority of Haitian and Santo Domingan examples have 27 to 29 scale rows, and the majority of Cuban specimens 23 to 25. It is probably also true that the majority of the latter have interparietals and that the former mostly lack them. None of our specimens show an exception from this rule. But if the specimen figured by Jan[15] is really from Santo Domingo, as stated in the text (p. 75), it is an instance

[14] Proc. Phila. Acad., 1894, p. 436.

[15] Icon. Ophid., livr. 5, 1864, pl. ii, fig. 1.

from that island of a specimen possessing interparietals. That a certain amount of differentiation has taken place, there can be no doubt; how much, can only be settled by the accumulation of much more material.

Tropidophis cana (Cope).

Ungalia cana Cope, 1868, Proc. Acad. Nat. Sci. Phila., p. 129.

The low number of ventrals alone is sufficient to distinguish this species.

Alsophis angulifer vudii (Cope).

Alsophis vudii Cope, 1862, Proc. Acad. Nat. Sci. Phila., p. 74.

Boulenger has denied this form recognition by placing it as a synonym of the Cuban *A. angulifer* (Bibron). I find, however, that the Bahama specimens, on the average, have fewer ventrals. Thus in ten specimens from New Providence, Eleuthera and Long Island, the ventrals vary between 158 and 171, averaging 164, while in twenty-one Cuban specimens the average is 171, the extremes being 164 and 180. There is also an average smaller number of subcaudals in the Bahama form, viz., 110 as against 115 in the Cuban. Under these circumstances it seems best to recognize the Bahama form by name, and as the two forms intergrade, a trinominal appellation is here applied to it.

A single specimen from Eleuthera, collected by Mr. Riley during the Baltimore Geographic Society Expedition, has 19 scale rows, while all the other specimens examined have 17. I can discover no other differences, and with only one specimen it is impossible to say whether this deviation is individual or not.

Leimadophis (?) rubescens (Cope).

Diadophis rubescens Cope, Proc. Amer. Philos. Soc., xxii, 1885, p. 403.

Boulenger refers Cope's *Diadophis rubescens* to *Alsophis angulifer* (*vudii*) as a synonym. Apparently he bases this indentification upon the complete agreement of the number of scales and scutes constituting the regular scale formula. I have not had an opportunity to examine the unique type specimen, but I would call attention to the fact that Cope describes his species as having only one pore to each scale. This, if correct, would preclude its being an *Alsophis*, while on the other hand I can see no good reason why it may not be a form of *Leimadophis* more or less closely allied to *L. andreæ* (Reinhardt and Luetken).

DISTRIBUTION OF BATRACHIANS AND REPTILES (EXCEPT MARINE TURTLES) OCCURRING IN THE BAHAMA ISLANDS.

The distribution of batrachians and reptiles occurring in the Bahama Islands will now be given. In reading these tables it should be understood that M denotes that specimens are in the U. S. National Museum; C, that occurrence is recorded by Cope; G, that occurrence is recorded by Garman; B, that occurrence is recorded by Barbour; + that the identical species occurs outside the Bahamas; — that species is represented by a closely allied form; ? that the relationship of the Bahama species to the form inhabiting the island is doubtful.

	SPECIES.	Little Abaco.	Great Abaco.	Great Bahama.	Stranger Cay.	Eleuthera.	New Providence.	Andros.	Cat Island.	Long Island.	Green Cay.	Crooked Island.	Watlings.	Rum Cay.	Turks Islands.	Great Inagua.	Florida.	Cuba.	Haiti.	ADDITIONAL LOCALITIES.
1	*Hyla septentrionalis* Boulenger	B					M	B						G				+	+	
2	*Hyla squirella* Latreille				B												+			S. E. North America.
3	*Eleutherodactylus ricordii* (Duméril & Bibron)						CB	B									+	+		
4	*Sphaerodactylus notatus* Baird	B	C		B		M										+	+	+	
5	*Sphaerodactylus asper* Garman							G										—	—	
6	*Sphaerodactylus corticolus* Garman												M	G					?	
7	*Sphaerodactylus decoratus* Garman						B	B						G				—	—	
8	*Sphaerodactylus flavicaudus* Barbour							B												
9	*Mabuya sloanii* (Daudin) (?)														C				+	Porto Rico; Virgin Isls.
10	*Ameiva thoracica* Cope		C			M	M	C										—		
11	*Ameiva maynardii* Garman															CG			—	
12	*Anolis porcatus* Gray		C			C	M	B	M								—	+		
13	*Anolis porcatus brunneus* (Cope)											C						—		
14	*Anolis ordinatus* Cope	B	M		B	M	M	B	M					M				—		
15	*Anolis* (sp)														C				?	
16	*Anolis leucophaeus* Garman															CG			—	
17	*Anolis moorei* Cope															C			—	
18	*Anolis oligaspis* Cope						C													
19	*Anolis distichus* Cope		C				M	B	M									—		
20	*Cyclura baeolopha* Cope							M												
21	*Cyclura cyclura* (Cuvier) (?)								C									+?		
22	*Cyclura rileyi* Stejneger												M							
23	*Cyclura carinata* Harlan														C					
24	*Leiocephalus carinatus* Gray		M	B	B		C	M	C			C						+		
25	*Leiocephalus virescens* Stejneger										M							—		
26	*Leiocephalus loxogrammus* Cope												M	M				—		
27	*Leiocephalus schreibersii* (Gravenhorst)															G			+	
28	*Leptotyphlops albifrons* (Wagler)												M							Caribbean Isls.; S. Amer.
29	*Typhlops lumbricalis* (Linné)		M															+	+	British Guiana; Antilles generally.
30	*Epicrates chrysogaster* (Cope)														C				—	
31	*Epicrates striatus* (Fischer)						M	G											+	
32	*Tropidophis pardalis* (Gundlach)					C	CB											+		
33	*Tropidophis cana* (Cope)															M			—	
34	*Leimadophis* (?) *rubescens* (Cope)						C											?		
35	*Alsophis angulifer vudii* (Cope)					M	M		C	M								—		
	Total	3	7	1	4	5	14	12	6	1	1	2	4	5	4	5	4	18	15	4

RELATIONS AND ORIGIN OF THE BAHAMA HERPETOLOGICAL FAUNA.

An inspection of the previous table shows that out of a total of thirty-five species and subspecies (excluding the marine turtles) no less than twenty-two are considered peculiar or restricted to the archipelago in exactly the form in which they occur there.

On the other hand, there are thirteen species (one doubtful) which are regarded as specifically and subspecifically identical with forms occurring elsewhere.

Of the twenty-two forms restricted to the archipelago, three are mere local representatives on a single island of a species occurring typically over a greater area, viz.: *Sphærodactylus flavicaudus* Barbour, *Anolis brunneus* Cope, and *Leiocephalus virescens* Stejneger. Fifteen are more or less closely related to species occurring in Cuba or Haiti, while the relationship of the remaining 4 is somewhat dubious on account of our deficient knowledge of their status, due to absence or insufficiency of material. But it is only fair to say that even in the case of these, the relationship is distinctly with the Greater Antilles. It will therefore be seen that while there is a certain amount of specialization due to isolation, the difference from the herpetological fauna of the Greater Antilles is one of degree only.

The derivation of this fauna is consequently not difficult to trace. Situated as the Bahamas are to the southeast of Florida, to the northeast of Cuba and to the north of Haiti, it is to these localities we will have to look for the origin of the Bahama batrachians and reptiles.

Relations to Florida.

Only four species identical with or closely related to species occurring in Florida have hitherto been recorded from the Bahamas, viz.:

Hyla squirella Latreille.

Eleutherodactylus ricordii (Duméril and Bibron).

Sphærodactylus notatus Baird.

Anolis porcatus Gray.

Of these, one, *Hyla squirella* (which is strictly North American), is confined to a small key north of Grand Bahama, and it is quite probable that it has been accidentally introduced by man as suggested by Mr. Barbour, who discovered it there.

The three other species occur in Cuba as well as in the Bahamas, and one even in Haiti. On the other hand, two of these, *Eleutherodactylus ricordii*

and *Sphærodactylus notatus* are in Florida confined to the extreme southern portion of the peninsula. The third species, *Anolis porcatus,* which is identical in the Bahamas and in Cuba, is represented in Florida by *A. carolinensis* Duméril and Bibron, the so-called Florida "chameleon." These forms differ more than they are usually given credit for, though of course there can be no doubt that the *A. carolinensis* is a direct descendant of *A. porcatus.* The former is not restricted to the peninsula of Florida, but extends on the North American mainland along the Atlantic coast into North Carolina, and along the Gulf coast to the Mexican boundary.

From these facts it seems perfectly safe to draw the conclusions: (1) that all these species came to the Bahamas from Cuba; (2) that they also reached Florida from Cuba; (3) that the arrival of the *Anolis* to the North American mainland took place sufficiently long ago to allow it to become specifically differentiated and to spread all over the southern coast region, while the tree-toad and the gecko only very recently found their way into Florida.

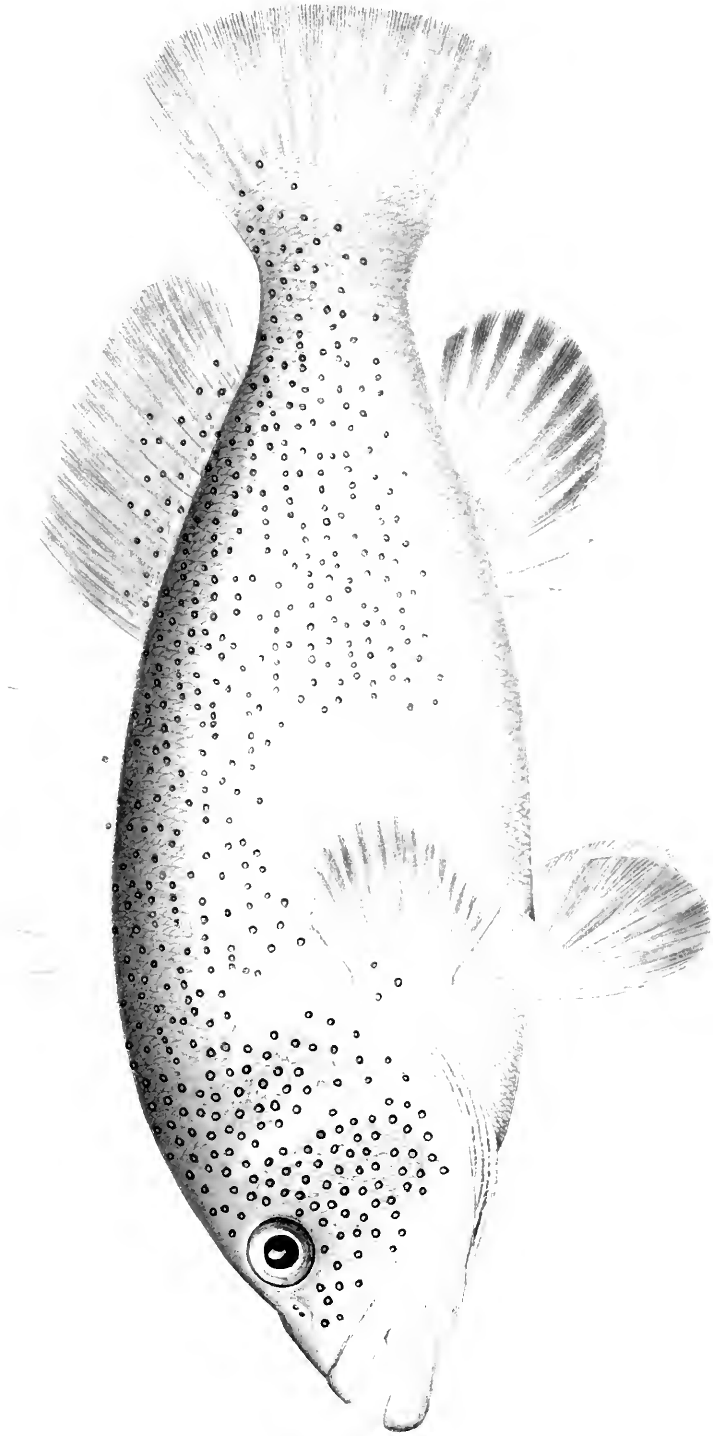
It follows that there is no indication of any direct relation between the herpetological faunas of the Bahamas and Florida.

Relations to Cuba.

The table showing the distribution of the Bahama species indicates that at least seven (plus one doubtful) are identical with Cuban species. Three of these have already been dealt with. Of the remaining, one is of wide distribution in the Antilles and northern South America, viz., the blind snake, *Typhlops lumbricalis* (Linné), while another, *Hyla septentrionalis* Boulenger, is also common both in Haiti and Jamaica.

Eight other species (with two local subspecies) are closely related to Cuban species, of which only two are also represented equally close by Haitian forms. Altogether eighteen forms point directly to Cuba as their original home.

An inspection of the table alluded to will reveal the striking circumstance that all the species related to Cuba are found only on the islands situated upon the great Bahama bank defined by the 500-fathom line or at least northwest of a line through the Mariguana Passage, and that conversely, though with one notable exception, all the forms occupying islands situated on the great bank are more nearly related to Cuban forms than to any other (except of course when the Cuban form also occurs in Haiti).



A. HOEN & CO., Lith.

A. H. BALDWIN ad nat. del.

Bodianus fulvus punctatus (Linnaeus)
NEGRO FISH
NATURAL SIZE

The exception alluded to is that of the great boid snake *Epicrates striatus* (Fischer), which, though occurring in the Bahamas, so far as known, only on New Providence and Andros, is indistinguishable from the Haitian specimens and clearly distinct from *E. angulifer* (Bibron), which represents the latter in Cuba. This case is apparently so abnormal that the only reasonable explanation seems to be the suggestion that this snake has been accidentally introduced by the agency of man at a comparatively recent date.

Another circumstance is obvious from a glance at the table, viz.: that the two northernmost of the large islands, from which we have collections, Abaco and Eleuthera, have thus far yielded no species not found on the islands nearer Cuba, with one exception. The exception is the blind snake, *Typhlops lumbricalis* (Linné), which has only been recorded from Abaco. From the fact that this species is generally distributed over the entire Antillean region, it appears highly probable that it also occurs in the intervening Bahama Islands, and that its retired habits and the insufficiency of our explorations are responsible for this apparent exception. The inference based on the above observation is that the islands which are peripheral from a geographic standpoint also from a distributional standpoint present themselves as peripheral relative to Cuba.

Relations to Haiti.

Six species are identical with forms inhabiting Haiti, several of which have been mentioned above, viz.: *Hyla septentrionalis* Boulenger, *Sphærodactylus notatus* Baird, *Typhlops lumbricalis* (Linné), and *Epicrates striatus* (Fischer). The first three are of comparatively wider distribution and occur also in Cuba, and the abnormal case of the latter has been discussed above. None of these are thought to possess any special significance.

In addition to the two other Haitian species occurring in the Bahamas, *Mabuya sloanii* (Daudin) and *Leiocephalus schreibersii* (Gravenhorst), there are seven forms [16] more or less intimately related to the Haitian species, two of which are about equally related to Cuban forms, and hence of less interest. The seven species to which we then direct our attention are as follows:

Mabuya sloanii (Daudin) (?).

Ameiva maynardii Garman.

Anolis leucophæus Garman.

Anolis moorei Cope.

[16] Eight, if we include the somewhat problematical *Anolis* from Turks Islands called *A. ordinatus* by Cope.

Leiocephalus schreibersii (Gravenhorst).

Epicrates chrysogaster (Cope).

Tropidophis cana (Cope).

Of these *Mabuya sloanii* has a distribution extending beyond Haiti, but the significant fact about it is that it does not occur in Cuba, and as not even the genus is represented in the latter island, it matters comparatively little that the specific identity of the Turks Islands skink is not settled beyond a shadow of a doubt.

It will be seen that all the above seven species so closely related to the exclusively Haitian fauna are confined to Turks Islands and Great Inagua. These islands are separated from the islands on the great bank not only by deeper water (1000 to 1500 fathoms), but by wider channels less obstructed by small islands or keys. To the south of them Haiti is the nearest land though separated by a very deep channel more than 2000 fathoms deep. Great Inagua, moreover, is nearly as close to the east end of Cuba as to Haiti.

Opposing the fact that the islands situated on the same bank and nearest to Cuba have a fauna most closely allied to that of Cuba, we have the corresponding fact that the islands nearest to Haiti, though not on the same bank as the latter, have a fauna most closely allied to Haiti.

Relations of Rum Cay and Watlings Island.

The herpetological relations of these islands to the rest of the archipelago as well as to Cuba and Haiti are not quite clear. This unfortunate state of affairs is due not only to our defective knowledge of their own fauna in particular but of that of the other islands both east and west of them. In a measure their situation is intermediate between the two groups of islands treated of above. On the other hand, they are quite peripheral and their isolated location in deep water outside of the great bank gives them a certain independent status. Scanty as our knowledge of their reptiles is, these points are also indicated in their fauna, though possibly somewhat obscurely.

The following species have been recorded from Rum Cay and Watlings:

<table>
<tr><th>Watlings Island.</th><th>Rum Cay.</th></tr>
<tr><td></td><td>Hyla septentrionalis Boulenger.</td></tr>
<tr><td colspan="2" align="center">Sphærodactylus corticolus Garman.</td></tr>
<tr><td>Cyclura rileyi Stejneger.</td><td>Sphærodactylus decoratus Garman.</td></tr>
<tr><td colspan="2" align="center">Leiocephalus loxogrammus Cope.</td></tr>
<tr><td>Leptotyphlops albifrons (Wagler).</td><td>Anolis ordinatus Cope.</td></tr>
</table>

Of these *Hyla septentrionalis* and *Sphaerodactylus decoratus* seem equally close to Cuba and Haiti. *S. corticolus* appears to lean more to Haiti. *Leiocephalus loxogrammus* and *Anolis ordinatus* are of decidedly Cuban relationship. *Cyclura rileyi* is uncertain, but probably closer to Cuba than to Haiti. Finally *Leptotyphlops albifrons* is a South American species which has not hitherto been found in the Greater Antilles, the Virgin Islands or any other island in the Bahamas. There would be nothing surprising, however, if it were found later in all these islands, especially in Haiti.

As will be seen, nothing definite can be concluded from the above.

CONCLUSIONS.

The first and most obvious result of the above attempt to analyze the herpetological fauna of the Bahamas is the conviction that the archipelago is as yet far too imperfectly explored, and that exhaustive collections from many islands which have not yet been visited as well as from those already superficially examined, are necessary before a correct picture of their reptile world can be drawn.

It may be well to summarize, however, the preliminary conclusions at which we have arrived:

1. The herpetological fauna of the Bahamas is derived directly from the nearest islands of the Greater Antilles.

2. The islands situated on the great bank which is connected with Cuba by the 500-fathom line are directly and closely allied herpetologically to the latter island.

3. Great Inagua and Turks Islands show similarly strong relationships to the island of Haiti.

4. There is no direct connection between the herpetological fauna of the Bahamas and Florida.

5. The isolation of the various species on the separate islands has been sufficiently complete and protracted to have resulted in a considerable amount of specialization.

BIRDS OF THE BAHAMA ISLANDS

BIRDS OF THE BAHAMA ISLANDS

BY

JOSEPH H. RILEY,

Aid, Division of Birds, U. S. National Museum.

INTRODUCTION.

During the months of June and July, 1903, the writer was granted leave of absence from the U. S. National Museum in order to join the Expedition sent out to the Bahama Islands by the Geographical Society of Baltimore. While a member of this Expedition, he was in charge of the Division of Land Zoology and was ably assisted in his collecting by Mr. Samuel H. Derickson, a student at the Johns Hopkins University. On the return of the party, Messrs. Leonhard Stejneger and Gerrit S. Miller worked up the batrachians, reptiles and mammals taken on the Expedition and have published on them elsewhere in this volume, and Dr. George B. Shattuck, the Director of the Expedition, has requested me to discuss the Bahama birds.

Although much still remains to be learned regarding the birds of the Bahamas, nevertheless they have received more study than any other group of land animals, and the present paper is written to review our present knowledge in regard to the Ornithology of the Bahamas rather than in the hope of adding much new material to that already in our possession.

ORNITHOLOGICAL EXPLORATIONS.

The first naturalist to visit the Bahama Islands for the purpose of seriously studying the natural history was Mark Catesby, who published the results of his travels in America in two large folio volumes entitled *The Natural History of Carolina, Florida, and the Bahama Islands,* 1731-1748. They contained 220 colored plates with an appendix of 20 plates and a map, the text printed in both English and French in parellel columns. Catesby tells us that he visited New Providence, Eleuthera, Andros, Abaco, and the neighboring islands. His plates and descriptions served Linnæus and others as the basis for many of their species. Only a few Bahama birds were indicated,

however, as Catesby says that his time was occupied principally, while on the Islands, with studying the fishes.

After Catesby's visit, the Islands seem to have been almost neglected by naturalists until Dr. Henry Bryant in 1859 made a trip to them, visiting New Providence, Berry Islands, Biminis, east side of Andros and neighboring keys, Exuma, and the Ragged Island chain of keys. The ornithological results of this trip were published the same year in *The Proceedings of the Boston Society of Natural History*, and one or two subsequent short articles in the same journal, being the first connected account of the Bahama avifauna. Dr. Bryant made a second visit to the Islands in 1866 for the purpose of visiting Great Inagua, but touched on his way thither some islands that he had not previously visited, such as Watlings Island, Rum Cay, Long Island, Acklin Island and Fortune Island. He published a paper during the same year in the same journal as his previous papers. Though Dr. Bryant described most of his discoveries himself, one of them, *Doricha lyrura*, was named by Gould from his specimens after his death, but owing to the removal of the original label the exact locality could not be given and Gould made an unfortunate guess.

Mr. C. B. Cory has personally made several trips to the Islands and has employed collectors who have visited nearly every island of the group, except some of the smaller cays, and it is largely to him that we owe our present knowledge of the distribution of the Bahama birds. The results of his studies have been published in his several works on West Indian birds, the various volumes of *The Auk*, and in his quarto work entitled *The Birds of the Bahamas*, etc., of which two editions, almost identical in appearance, have been issued.

Mr. C. J. Maynard has also made a number of excursions to the Bahamas, visiting New Providence, Andros, Green Cay, Seal Cay, the Washerwomen Cays, the Ship Channel Cays, Rum Cay, Long Island, and Great Inagua,[1] and on subsequent trips some of the other islands. The ornithological results of his visits have been either published by himself in his *Birds of Eastern North America*, second edition, 1896, or in his various other publications, and by Mr. Outram Bangs.[2] While Mr. Maynard first discriminated several of the races that have since been recognized as valid, his choice of names in several instances was most unfortunate.

[1] *Contributions to Science*, Vol. I, 1889, 106.
[2] *The Auk*, 1900, pp. 283-293.

In 1886 the naturalists of the U. S. Fish Commission Steamer *Albatross*, which stopped at Abaco, New Providence, Eleuthera, Cat Island, Watlings Island, Rum Cay, Green Cay, Concepcion Island, and Booby Rock, succeeded in making a large collection of birds which have formed the basis for several papers by Mr. Ridgway and others. In one of these contributions[3] Mr. Ridgway gave a complete list of this collection.

Andros was visited in 1890 by Mr. and Mrs. John I. Northrop, mainly with a view of studying the botany, but making at the same time a good collection of birds. One of the results of their trip was the discovery of the beautiful species of oriole named by Dr. J. A. Allen after its discoverer. Mr. Northrop's published observations[4] is one of the few papers dealing with the habits of the Bahama birds and characteristics of their environment.

Mr. J. Lewis Bonhote has spent considerable time in the Islands, residing mostly at Nassau, but making one or two excursions to the northern islands and Andros.[5] His various papers on the migration of birds, as their flights have been noted from the various Bahama lighthouses, are full of interest, and are the first instances of anything of the kind being attempted in the islands.[6] Mr. Bonhote was accompanied on one of his trips to Andros in search of flamingoes by Messrs. F. M. Chapman and L. A. Fuertes, who have published the accounts of their experiences elsewhere.

Capt. D. P. Ingraham has done extensive collecting upon the Bahamas but has published nothing upon the birds, that I am aware of.

While from the above it will be noticed that considerable attention has been paid to the Bahamas in recent years, our knowledge of the avifauna is far from complete. Great Bahama Island has been visited but once by a naturalist, to my knowledge, and then only for a short while, though from its proximity to Florida some interesting facts should be brought to light. Great Abaco also has never been thoroughly explored, though it is one of the wildest islands of the group and is covered with a pine forest of large trees with a heavy undergrowth of a large *Pteris* fern. Scarcely anything is known of the life-histories of the endemic species or of their ecology, and the relationships of the various species of *Geothlypis* are yet to be worked out. Why

[3] *The Auk*, 1889, pp. 333-339.

[4] *The Auk*, 1891, pp. 64-80.

[5] *The Ibis*, 1889, pp. 506-520; and 1903, pp. 273-315. *The Avicultural Magazine*, Vol. VIII and IX.

[6] *The Auk*, 1901-1903.

should a small island about twenty miles long by eight miles broad with absolutely no physiographic features produce three species of *Geothlypis?* Do they differ in habits, song, or character of country they inhabit? That is a problem to tax the energies of an active field naturalist.

NOTES ON THE ZOOGEOGRAPHICAL POSITION OF THE BAHAMA ISLANDS.

The West Indies north of the island of Tobago, including the Bahama Islands, comprise a region of the Neotropical Realm, that from an ornithological point of view may be considered, from the peculiarities of the birds, of equal rank to the North American Region of Dr. Allen. The islands may be, using the nomenclature proposed by Dr. Allen in his papers on Zoogeography, divided into three provinces, as follows: (1) a Lesser Antillean Province, consisting of the islands from and including Grenada, north to the Anegada Channel, known collectively as the Windward and Leeward Islands; (2) a Greater Antillean Province, consisting of Cuba, the Caymans, Jamaica, Porto Rico, and the islands east to the Anegada Channel; (3) a Bahaman Province, comprising the group of islands of that name. The last must not be considered faunally of equal rank to either of the other two, as it possesses only one peculiar genus of birds, and only one indigenous land mammal, but from geographic considerations this is the best arrangement that can be made at present and all the provinces as herein defined present more or less striking peculiarities. The Greater Antilles from their greater age and longer isolation from the mainland, if they ever were connected, possess the most peculiar endemic fauna; the Bahamas, from their recent oceanic origin, contain the least. In the present connection we are only concerned with the Bahaman Province.

Mr. F. M. Chapman in an able paper[*] on the origin of the Bahama avifauna has covered the ground very thoroughly, showing that while on account of their oceanic origin a considerable portion of the fauna is fortuitous, as in all true oceanic islands, yet from their proximity to Florida on the one hand, and Cuba and Haiti on the other, the majority of the resident land birds have been derived from those respective areas, of which Cuba has furnished the most. Though a considerable number of birds have been described or added to the Bahama list since Mr. Chapman's paper was published, they have been of such a nature as not to materially affect his conclusions,

[*] *American Naturalist*, 1891, pp. 528-539.

A. HOEN & CO., Lith.

Sparisoma aurofrenatum (Cuvier & Valenciennes).

GOLD-BRIDLED PARROT-FISH

NATURAL SIZE

A. H. BALDWIN,
ad nat. del.

but owing to these additions and to increase the value of the check-list, it has been deemed best to give a brief outline of the peculiarities of the avifauna.

Of the two hundred and four species and subspecies of birds that have been recorded from the Bahamas, only one hundred are summer residents; the rest have an accidental occurrence, or are migrants, mainly from the eastern United States. Of the summer and permanent residents, forty-four are endemic and fifty-six non-endemic. Taking up the latter first, we find that thirty-two are of more or less wide distribution, mainly water birds, leaving twenty-four for consideration, of which six are found in the West Indies proper, namely: *Colymbus dominicus* Linné (West Indies generally), *Puffinus lherminieri* Lesson (West Indies generally and Bermuda), *Dendrocygna arborea* (Linné) (West Indies generally), *Tyrannus cubensis* Richmond (Cuba), *Mimus polyglottus orpheus* (Linné) (Greater Antilles), *Margarops fuscatus* (Vieillot) (Greater and northern Lesser Antilles and Bonaire); and thirteen, as follows, in the eastern United States, mainly Florida: *Oxyechus vociferus* (Linné), *Ochthodromus wilsonius* (Ord), *Zenaidura macroura* (Linné), *Buteo borealis* (*umbrinus* Bangs?), *Strix pratincola* Bonaparte, *Coccyzus minor maynardi* (Ridgway), *Coccyzus americanus* (Linné), *Sitta pusilla* Latham,[9] *Dendroica dominica* (Linné), *Dendroica discolor* (Vieillot), *Seiurus aurocapillus* (Linné), *Agelaius phœniceus bryanti* Ridgway. The following are found in the Greater Antilles, the Bahamas and Florida, and have probably reached the latter locality by way of the Bahamas: *Zenaida zenaida* (Bonaparte), *Geotrygon chrysia* Salvadori, and *Vireosylvia calidris barbatulus* (Cabanis). All three may be regarded, comparatively speaking, as quite recent additions to the Florida avifauna. To these three might be added *Tyrannus dominicensis* (Gmelin) of a rather wide tropical range.

The forty-four endemic species, from their importance as bearing upon the derivation of the Bahama avifauna, will be taken up in order and the nearest relative given when it is possible to do so.

1. *Butorides virescens bahamensis* (Brewster).—*Butorides virescens* (Linné) is said to visit the Islands as a migrant in winter and this light-colored form has probably been derived from some that failed to leave on the return migration; finding the conditions suitable for existence they have become permanent residents. Closely related forms occur in the West Indies and on the American continent.

[9] Recorded only from Great Bahama Island.

2. *Rallus crepitans coryi* (Maynard).—More closely related to *Rallus crepitans* of northeastern United States than to any of the West Indian forms of clapper rail or to *R. c. waynei* Brewster of southern Georgia and northern Florida.

3. *Columbigallina passerina bahamensis* (Maynard).—Lighter in color even than *C. p. pallescens* (Baird) of Mexico and the western United States, but probably derived from one of the West Indian forms which have not been thoroughly worked out as yet.

4. *Pandion haliætus ridgwayi* (Maynard).—Doubtfully distinct from *P. h. carolinensis* (Gmelin).

5. *Speotyto cunicularia cavicola* Bangs.

6. *Speotyto cunicularia bahamensis* Cory.—The Florida Burrowing Owl has possibly reached the peninsula by way of the West Indies and the Bahamas. The Bahama form seems to be more nearly related to *S. c. dominicensis* Müller of Haiti.

7. *Amazona leucocephala bahamensis* (Bryant).—Doubtfully distinct from *A. leucocephala* of Cuba.

8. *Saurothera bahamensis* Bryant.

9. *Saurothera andria* Miller.—A genus confined to the Great Antilles and the Bahamas. The Bahama species are closely related to *Saurothera merlini* D'Orbigny of Cuba, from which they differ principally in their lighter colors.

10. *Dryobates villosus maynardi* Ridgway.—Closely related to *D. v. auduboni* (Swainson) of Florida.

11. *Centurus superciliaris nyeanus* (Ridgway).—(Watlings Island.)

12. *Centurus superciliaris blakei* (Ridgway).—(Great Abaco.)

13. *Centurus superciliaris bahamensis* (Cory).—(Great Bahama.) Closely related to *Centurus superciliaris* (Temminck) of Cuba. A species closely related to the Cuban bird inhabits Grand Cayman. These birds have developed a well-marked form, apparently, in every island in which they have become established in the Bahamas.

14. *Chordeiles virginianus vicinus* Riley.—Intermediate between *C. v. chapmani* Coues of Florida and *C. v. minor* (Cabanis) of Cuba, Jamaica and Porto Rico, but on the whole more nearly related to the Florida form.

15. *Doricha lyrura* Gould.—(Great Inagua only.)

16. *Doricha evelynæ* (Bourcier).—Bahamas generally except Great Inagua. *Doricha* is a genus occurring from southern Mexico to the Isthmus of Panama, but not in any of the West Indies proper. Strange to say, the nearest

relative of the Bahama species is *Doricha bryanti* Lawrence of Costa Rica, which would indicate that their origin in the Bahama Islands is fortuitous.

17. *Riccordia ricordii æneoviridis* (Palmer & Riley).—A closely related form of the Cuban *Riccordia ricordii* (Gervais) that has only established itself apparently in Great Bahama, Abaco and Andros.

18. *Pitangus bahamensis* (Bryant).—Closely related to *P. candifasciatus* D'Orbigny of Cuba.

19. *Myiarchus lucaysiensis* (Bryant).—Closely related to *M. sagræ* (Gundlach) of Cuba.

20. *Blacicus bahamensis* Bryant.—*Blacicus* is a genus occurring almost throughout the West Indies, each of the larger islands or group of islands having a distinct species, and on the mainland from southern Mexico to southern Brazil. The Bahama bird finds its nearest relative possibly in *Blacicus caribæus* (D'Orbigny) of Cuba.

21. *Mimus gundlachi* Cabanis.

22. *Mimus gundlachi bahamensis* (Bryant).—Though the type of *M. gundlachi* Cabanis came from the Cayo Santa Maria, off the Cuban coast, it has not been taken, to my knowledge, on the mainland of Cuba, and if really an inhabitant of the island is apparently confined to the cays of the northern coast, where the conditions are somewhat similar to the Bahamas. *Mimus gundlachi hilli* (March) is confined to Jamaica and these three forms find their nearest relative in *Mimus saturninus* (Lichtenstein) of southeastern Brazil, so their occurrence in Jamaica and the Bahamas must be fortuitous.

23. *Mimocichla plumbea* (Linné).—*Mimocichla* is a genus confined to the Greater Antilles (except Jamaica, St. Croix and the small islands to the eastward of Porto Rico), Swan Island, Dominica and the Bahamas; each island (in the case of the Bahamas, group of islands) on which the genus occurs having a more or less well-marked species or form; Cuba with two. The nearest relative of the Bahama bird is probably *Mimocichla rubripes schistacea* (Baird) of eastern Cuba.

24. *Polioptila cærulea cæsiogaster* Ridgway.—A well-marked form of *P. cærulea* (Linné) of the United States. Also occurs on Cozumel Island, Yucatan.

25. *Vireo crassirostris* (Bryant).

26. *Vireo crassirostris flavescens* (Ridgway).—Both belong to a small group of brown-eyed vireos inhabiting Cuba, Porto Rico, Jamaica,[10] Grand Cay-

[10] *Vireo modestus* Sclater of Jamaica has the irides whitish, I am informed.

man, and the mainland from southern Mexico to Costa Rica. The nearest relative is *V. crassirostris alleni* Cory of Grand Cayman. They are probably of fortuitous origin in the Bahamas. It seems particularly strange that no vireo of this section has ever been found in Haiti.

27. *Callichelidon cyaneoviridis* (Bryant).—The only peculiar genus developed amongst the Bahama birds. It finds its nearest ally probably in *Lamprochelidon* of Haiti and Jamaica, though it must be admitted that the immature Bahama Swallow closely resembles *Iridiprocne bicolor* (Vieillot).

28. *Dendroica petechia flaviceps* Chapman.—Closely related to *D. p. gundlachi* (Baird) of Cuba. Forms of *Dendroica petechia* (Gmelin) are found in the Greater Antilles, the northern Lesser Antilles, and the Galapagos Islands.

29. *Dendroica pityophila bahamensis* Cory.—Closely related to *Dendroica pityophila* (Gundlach) of western Cuba, where it lives exclusively in the pines of the mountains, so far as known. *D. pityophila* (Gundlach) has never been taken even in the Isle of Pines, an island so recently, geologically speaking, connected with Cuba as not to have developed a peculiar fauna, except in the case of *shells*, a few birds closely related to Cuban species, and a peculiar rat, *Capromys prehensilis gundlachi* Chapman.

30. *Dendroica vigorsii achrustera* Bangs.

31. *Dendroica vigorsii abacoensis* Ridgway.—Closely related to *Dendroica vigorsii* (Audubon) of the eastern United States, probably reaching the Bahamas by way of Florida.

32. *Geothlypis rostrata* Bryant.

33. *Geothlypis maynardi* Bangs.

34. *Geothlypis tanneri* Ridgway.

35. *Geothlypis incompta* Ridgway.

36. *Geothlypis exigua* Ridgway.

37. *Geothlypis coryi* Ridgway.

38. *Geothlypis flavida* Ridgway.—These puzzling birds have been, probably along with *Geothlypis beldingi* Ridgway of lower California, derived from the same "original stock" as the forms of *G. trichas* (Linné), which came originally from the south by way of Mexico, producing a form in lower California and sending another by way of Florida to the Bahamas. *G. beldingi* Ridgway, from the island nature of its habitat, being surrounded on the north by deserts and on the south by the sea, has resulted in producing the same

characters or in retaining the characteristics of the "original stock" in the same manner as an island habitat has acted for the Bahama species, so that to-day we find the apparent anomaly of a species in lower California finding its nearest relative in the Bahama Islands.

39. *Cœreba bahamensis* (Reichenbach).—One of a group of four closely-related species: *Cœreba caboti* (Baird) of Cozumel Island, Yucatan, *Cœreba sharpei* (Cory) of the Caymans, and *Cœreba tricolor* (Ridgway) of Old Providence, an island situated about one hundred and fifty miles off the coast of Nicaragua. Strange to say, although this genus is found throughout the West Indies and on the American continent from Mexico to Peru, it is not found in Cuba. *C. bahamensis* (Reichenbach) finds its nearest relative in *C. caboti* (Baird).

40. *Icterus northropi* Allen.—One of a small group of orioles inhabiting Mexico, Central America, the Greater and Lesser Antilles. In color it more closely resembles *Icterus wagleri* Sclater of Mexico, *Icterus oberi* Lawrence of Montserrat, and *Icterus laudabilis* Sclater of St. Lucia than it does *Icterus hypomelas* (Bonaparte) of Cuba, *Icterus portoricensis* (Bryant) of Porto Rico, and *Icterus dominicensis* (Linné) of Haiti. *Icterus prothemelas* (Strickland) of Central America is very much like the Bahama species in color and the "original stock" of all these species probably came from there, making *I. northropi* Allen of fortuitous origin in the Islands.

41. *Spindalis zena* (Linné).

42. *Spindalis zena townsendi* (Ridgway).—Belong to a genus peculiar to the Greater Antilles with the single exception of *Spindalis benedicti* of Cozumel Island, Yucatan, to which the Bahama forms are more closely related than to those of the West Indies.

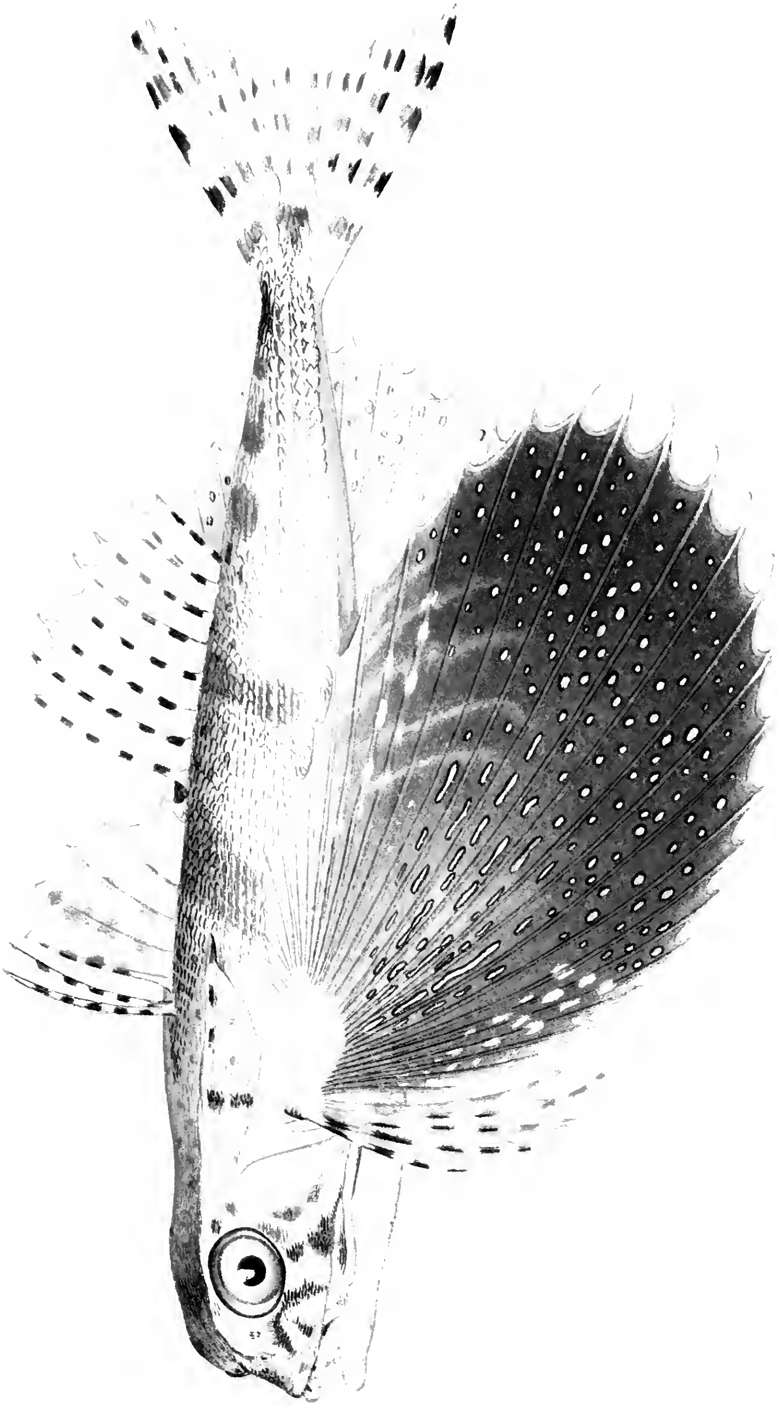
43. *Pyrrhulagra violacea* (Linné).—Closely related forms occur in both Jamaica and Haiti. The genus does not occur in Cuba or Grand Cayman, where its place is taken in Cuba by *Melopyrrha nigra* (Linné), and in Grand Cayman by *Melopyrrha taylori* Hartert, but nearly all of the other West India Islands have more or less closely related forms, and one form even reaches the mainland of South America, indicating the probable derivation of the "original stock." The Bahama species belongs to a section of the genus confined to the islands of Jamaica, Haiti, Porto Rico and St. Kitts, and has probably reached the Bahamas by way of Haiti.

44. *Tiaris bicolor* (Linné).—Forms of this species occur throughout the West Indies, even reaching the coast of South America and the islands of Curaçoa, Aruba and Bonaire. The Bahama bird has probably reached the Islands by way of Haiti, as it appears to be of only accidental occurrence in Cuba and Florida.

Arranging the birds according to their probable derivation we have the following groups:

Pandion haliaëtus ridgwayi (Maynard). *Amazona leucocephala bahamensis* (Bryant).	Of doubtful standing.
Doricha lyrura Gould. *Doricha evelynæ* (Bourcier). *Mimus gundlachi* Cabanis. *Mimus gundlachi bahamensis* (Bryant). *Vireo crassirostris* (Bryant). *Vireo crassirostris flavescens* Ridgway. *Callichelidon cyaneoviridis* (Bryant). *Icterus northropi* Allen.	Of doubtful or fortuitous origin.
Cœreba bahamensis (Reichenbach). *Spindalis zena* (Linné). *Spindalis zena townsendi* Ridgway.	Cozumel Island, Yucatan.
Butorides virescens bahamensis (Brewster). *Rallus crepitans coryi* (Maynard). *Dryobates villosus maynardi* Ridgway. *Chordeiles virginianus vicinus* Riley. *Polioptila cærulea cæsiogaster* Ridgway. *Dendroica vigorsii abacoensis* Ridgway. *Dendroica vigorsii achrustera* Bangs. *Geothlypis rostrata* Bryant. *Geothlypis maynardi* Bangs. *Geothlypis tanneri* Ridgway. *Geothlypis incompta* Ridgway. *Geothlypis exigua* Ridgway. *Geothlypis coryi* Ridgway. *Geothlypis flavida* Ridgway.	From the eastern United States by way of Florida, with the possible exception of *R. c. coryi* (Maynard).

A. HOEN & CO., Lith.



Cephalacanthus volitans (Linnaeus)
FLYING GURNARD; Bat-fish
ABOUT 2/3 NATURAL SIZE

A. H. BALDWIN.
ad nat. del.

Columbigallina passerina bahamensis (Maynard).	Greater Antilles.	Greater Antilles.
Speotyto cunicularia cavicola Bangs.	Haiti.	
Speotyto cunicularia bahamensis Cory.		
Pyrrhulagra violacea (Linné).		
Saurothera bahamensis Bryant.	Cuba.	
Saurothera andria Miller.		
Centurus superciliaris nyeanus (Ridgway).		
Centurus superciliaris blakei (Ridgway).		
Centurus superciliaris bahamensis (Cory).		
Riccordia ricordii æneoviridis (Palmer & Riley).		
Pitangus bahamensis Bryant.		
Myiarchus lucaysiensis (Bryant).		
Blacicus bahamensis (Bryant).		
Mimocichla plumbea (Linné).		
Dendroica petechia flaviceps Chapman.		
Dendroica pityophila bahamensis Cory.		

Leaving out of consideration two forms of doubtful standing, eight of doubtful or fortuitous origin, and three possibly derived from Cozumel Island, Yucatan, or of fortuitous origin, we have fourteen forms that have reached the Islands from the eastern United States by way of Florida and seventeen that have reached them from the Greater Antilles, the majority by way of Cuba. The seven species of *Geothlypis* have very probably been derived from one "original stock" form, as stated above, which lessens the value of Florida as a derivative center and increases that of Cuba. Now reducing the forms that have probably been derived from a single stock-form would give Florida seven and Cuba nine, but the forms derived from Cuba have gone further in specialization than the Florida forms, which would seem to indicate that the Greater Antillean forms were the first to colonize and that the Florida element is, comparatively speaking, of recent introduction. This would seem, it appears to me, to indicate that the Greater Antilles are of a much more ancient formation than southern Florida. The fact must not be lost sight of that several birds of extreme southern Florida, where the same conditions are said to prevail as in the Bahamas, have reached there probably by way of the Bahamas and not *vice versa*, namely: *Columba leucocephala*

Linné, *Zenaida zenaida* (Bonaparte), *Geotrygon chrysia* Salvadori, *Speotyto cunicularia floridana* Ridgway, *Crotophaga ani* Linné, *Coccyzus minor maynardi* (Ridgway), and *Tyrannus dominicensis* (Gmelin).

From the above review of the Bahama avifauna we may derive the following propositions:

First.—That the Bahamas are oceanic and of comparatively recent origin.

Second.—That the resident avifauna, while it contains a considerable fortuitous element, has been derived largely from the Greater Antilles by way of Cuba.

Third.—That the Florida element is of a more recent origin than that of the Greater Antillean.

Fourth.—That when a species is represented by closely related forms in the Greater Antilles and the United States, the Bahama bird will more closely resemble that of the United States, generally the form found in Florida, or in other words, the Bahamas are "arid tropical," which seems to check the deepening of color appearing in forms in the Greater Antilles and southward, as for example, *Ochthodromus wilsonius* (Ord), *Rallus crepitans coryi* (Maynard), *Zenaidura macroura* (Linné) and *Chordeiles virginianus vicinus* Riley.

Fifth.—That there is a minor faunal region of the rank of a fauna or district, embracing Watlings Island, Rum Cay, Concepcion Island, Long Island, and the islands to the southward. This is the region of least rainfall for the group and consequently less heavy vegetation.

LIST OF BAHAMA BIRDS.

The sequence of families in the following list is mainly that elaborated by Mr. Ridgway for his *Birds of North and Middle America*. Mr. C. B. Cory's *Catalogue of West Indian Birds* has been my chief source of information, and to his list of Bahama birds given therein, I have added such records as have been published since his book was issued or made such changes as the present state of our knowledge of the subject seemed to warrant.

N. B.—Birds known to breed are marked thus ‡: those peculiar to the Islands thus †.

Order COLYMBIFORMES (Diving Birds).

Colymbus dominicus Linné ‡ (West Indian Grebe). Eleuthera, Andros, Rum Cay, Watlings Island, Long Island.

Podilymbus podiceps (Linné) (Pied-billed Grebe). New Providence.

Order PROCELLARIIFORMES (Tube-nosed Swimmers).

Oceanites oceanicus (Kuhl) (Wilson's Petrel). New Providence.

Puffinus lherminieri Lesson ‡ (Antillean Shearwater). Abaco, New Providence, Andros, Green Cay (near New Providence), Washerwomen Cays, Ship Channel Cays.

Puffinus gravis (O'Reilly) (Greater Shearwater). New Providence.

Order CICONIIFORMES (Stork-like Birds, Herons, etc.).

Phaëthon americanus Grant ‡ (American Tropic Bird). Abaco, New Providence, Great Inagua, Cay Lobos, Long Rock (Exuma), Water Cay (Ragged Island), Cay Verde (30 miles east of Great Ragged Island).

Sula cyanops Sundevall ‡ (Blue-faced Booby). San Domingo Cay.

Sula leucogastra Boddært ‡ (Booby). Miraporvos, Great Ragged Island, San Domingo Cay, Cay Lobos (?), at Sea.

Phalacrocorax dilophus floridanus (Audubon) ‡ (Florida Cormorant). Great Bahama, Biminis, Andros, Abaco, New Providence, Watlings Island (?),[11] Cay Lobos.

Phalacrocorax mexicanus (Brandt) ‡ (Mexican Cormorant). Watlings Island.

Pelecanus occidentalis (Linné) ‡ (Brown Pelican). Abaco, Biminis, Berry Islands, Andros.

Fregata aquila Linné ‡ (Man-o'-War Bird). Great Bahama, Biminis, Berry Islands, Abaco, New Providence, Andros, Eleuthera, Cat Island, Rum Cay, Watlings Island, Great Inagua, Cay Lobos, Washerwomen Cays.

Phœnicopterus ruber Linné ‡ (American Flamingo). Abaco, Andros, Little Inagua, Great Inagua, Long Island, Mariguana.

Botaurus lentiginosus (Montagu) (American Bittern). New Providence.

Ardetta exilis (Gmelin) ‡ (Least Bittern). Great Bahama, New Providence.

Ardea herodias Linné ‡ (Great Blue Heron). Biminis, Berry Islands, New Providence, Andros, Great Inagua.

Herodias egretta (Gmelin) ‡ (American Egret). New Providence, Andros, Eleuthera, Watlings Island, Long Island.

Egretta candidissima (Gmelin) ‡ (Snowy Heron). Great Bahama, Great Inagua.

Dichromanassa rufescens (Gmelin) ‡ (Reddish Egret). Great Bahama, Abaco, New Providence, Andros, North Caicos, Grand Caicos, East Caicos.

Hydranassa tricolor ruficollis (Gosse) ‡ (Louisiana Heron). Berry Islands, New Providence, Andros, Watlings Island, Mariguana, North Caicos, Grand Caicos, East Caicos, Fortune Island.

Florida cærulea (Linné) ‡ (Little Blue Heron). New Providence, Andros.

Butorides virescens (Linné) (Green Heron). Winter migrant to the Bahamas.

Butorides virescens bahamensis (Brewster) †‡ (Bahama Heron). Abaco, Little Abaco, Biminis, New Providence, Andros, Eleuthera, Rum Cay, Watlings Island, Long Island.

Nycticorax nycticorax nævius (Boddært) (Black-crowned Night Heron). Abaco, Andros.

Nyctanassa violacea (Linné) ‡ (Yellow-crowned Night Heron). Abaco, Hog Cay (off Great Abaco), Little Abaco, Biminis, Berry Islands, Eleuthera, New Providence, Andros, Green Cay, Little Exuma, Mariguana, Great Inagua, Watlings Island, Long Island, Cay Lobos.

Plegadis autumnalis (Linné) (Glossy Ibis). Cay Lobos.

Ajaia ajaja (Linné) ‡ (Roseate Spoonbill). Great Inagua, Biminis.

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[11] We only found *P. mexicanus* on Watlings, but Cory records this form.

Order ANSERIFORMES (Geese, Ducks, etc.).

Erismatura jamaicensis (Gmelin) (Ruddy Duck). New Providence.
Aythya americana (Eyton) (Redhead). New Providence.
Fuligula marila (Linné) (Scaup Duck). Watlings Island, Rum Cay.
Fuligula affinis (Eyton) (Lesser Scaup Duck). New Providence, Andros, North Caicos, Grand Caicos, East Caicos.
Fuligula collaris (Donovan) (Ring-necked Duck). New Providence.
Clangula clangula americana (Bonaparte) (American Golden-eye). Bahamas (at sea).
Anas boschas Linné (Mallard). New Providence.
Mareca americana Gmelin (Baldpate). Andros.
Nettion carolinensis (Gmelin) (Green-winged Teal). New Providence.
Querquedula discors (Linné) (Blue-winged Teal). New Providence, Andros.
Pœcilonetta bahamensis (Linné) ‡ (Bahama Duck). Abaco, Andros, Long Island, North Caicos, Grand Caicos, East Caicos, Little Inagua, Great Inagua.
Dendrocygna arborea (Linné) ‡ (Antillean Tree Duck). Andros, Great Inagua.
Chen hyperborea nivalis (Forster) (Greater Snow Goose). New Providence, Great Inagua.

Order GALLIFORMES (Gallinaceous Birds).

Colinus virginianus bahamensis (Maynard) †‡ [12] (Bahama Bob-white). New Providence.

Order GRUIFORMES (Rails, Cranes, etc.).

Rallus crepitans coryi (Maynard) †‡ (Bahama Clapper Rail). Abaco, Berry Islands, New Providence, Rose Island, Andros, Eleuthera, Highborn Cay.
Porzana carolina (Linné) (Sora). New Providence, Little Abaco, Andros, Cay Lobos, Cay Sal, Bird Rock.
Ionornis martinica (Linné) (Purple Gallinule). New Providence, Andros, Cay Lobos, Cay Sal.
Gallinula galeata (Lichtenstein) ‡ (Florida Gallinule). New Providence, Great Inagua.
Fulica americana Gmelin ‡ (American Coot). Abaco, New Providence, Rum Cay.
Aramus giganteus (Bonaparte) (Limkin). Accidental on Cay Lobos.

Order CHARADRIIFORMES (Gulls, Shore Birds, Pigeons, etc.).

Larus argentatus Brünnich (Herring Gull). New Providence.
Larus atricilla Linné ‡ (Laughing Gull). Abaco, New Providence, Andros, Eleuthera, Rum Cay, Watlings Island, Mariguana, Long Island, Great Inagua.
Gelochelidon nilotica (Linné) ‡ (Gull-billed Tern). New Providence, Eleuthera, Andros, Rum Cay, Long Island, Miraporvos, Great Inagua.
Sterna maxima Boddært ‡ (Royal Tern). Great Bahama, Biminis, Berry Islands, New Providence, Eleuthera, Andros, Washerwomen Cays, Rum Cay, Long Island, Miraporvos, Great Inagua.
Sterna sandvicensis acuflavida (Cabot) ‡ (Cabot's Tern). New Providence, Andros, Washerwomen Cays, Cay Lobos, Acklin Island, Great Inagua.
Sterna hirundo Linné (Common Tern). Abaco, New Providence.

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[12] Said to have been introduced, which would seem to invalidate the recognition of this form.

Sterna dougalli Montagu ‡ (Roseate Tern). New Providence, Cay Lobos, North Cay, Great Inagua.

Sterna antillarum Lesson ‡ (Least Tern). Abaco, New Providence, Eleuthera, Andros, Washerwomen Cays, Cay Sal, Cay Lobos, Rum Cay, Watlings Island, Great Inagua.

Sterna fuliginosa Gmelin ‡ (Sooty Tern). Abaco, New Providence, Andros, Washerwomen Cays, Cay Sal, Cay Lobos, Long Island, Anguilla.

Sterna anæthetus Scopoli ‡ (Bridled Tern). Abaco, New Providence, Eleuthera, Andros, Washerwomen Cays, Long Island, Miraporvos, Booby Rocks.

Anous stolidus Linné ‡ (Noddy). New Providence, Andros, Washerwomen Cays, Long Island.

Himantopus mexicanus (Müller) ‡ (Black-necked Stilt). New Providence, Andros, Green Cay, Eleuthera, Rum Cay, Watlings Island, Long Island, Mariguana, Great Inagua.

Gallinago delicata (Ord) (Wilson's Snipe). New Providence.

Macrorhamphus griseus (Gmelin) (Dowitcher). New Providence, Andros.

Micropalama himantopus (Bonaparte) (Stilt Sandpiper). Fortune Island.

Actodromas maculata (Vieillot) (Pectoral Sandpiper). New Providence, Mariguana, Great Inagua, Fortune Island.

Actodromas fuscicollis (Vieillot) (White-rumped Sandpiper). New Providence, Fortune Island.

Actodromas minutilla (Vieillot) (Least Sandpiper). New Providence, Andros, Cay Sal, Long Island, Mariguana, Great Inagua.

Ereunetes pusillus (Linné) (Semipalmated Sandpiper). New Providence, Cay Sal, Great Inagua.

Calidris alba (Pallas) (Sanderling). New Providence Andros, Miraporvos.

Totanus melanoleucus (Gmelin) (Greater Yellow-legs). New Providence, Andros, Great Inagua.

Totanus flavipes (Gmelin) (Yellow-legs). New Providence, Andros, Eleuthera, Rum Cay, Watlings Island, Mariguana, Great Inagua, Fortune Island.

Helodromas solitarius (Wilson) (Solitary Sandpiper). New Providence, Fortune Island.

Catoptrophorus semipalmatus (Gmelin) ‡ (Willet). Abaco, New Providence, Andros, Current Island, Rum Cay, Long Island, Mariguana, North Caicos, Grand Caicos, East Caicos, Great Inagua.

Bartramia longicauda (Bechstein) (Bartramian Sandpiper). Mariguana.

Actitis macularia (Linné) (Spotted Sandpiper). Great Bahama, Little Abaco, Biminis, New Providence, Andros, Cay Lobos, Miraporvos.

Numenius hudsonicus Latham (Hudsonian Curlew). Bahamas (at sea).

Vanellus vanellus (Linné) (Lapwing). Accidental on Hog Island.

Squatarola squatarola (Linné) (Black-bellied Plover). New Providence, Eleuthera, Andros.

Charadrius dominicus Müller (American Golden Plover). New Providence, Cay Lobos,[13] Long Island.

Oxyechus vociferus (Linné) ‡ (Killdeer). Little Abaco, Biminis, New Providence, Andros, Cat Island, Watlings Island, Acklin Island, Mariguana, Great Inagua. Migratory and resident.

Ægialitis semipalmata (Bonaparte) (Semipalmated Plover). Abaco, Biminis, New Providence, Andros, Long Island, Great Inagua.

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[13] Recorded from Cay Lobos as *C. fulvus*.

Ægialitis meloda (Ord)[14] (Piping Plover). New Providence, Current Island, Great Inagua.

Ægialitis nivosa Cassin[15] (Snowy Plover). Long Island.

Ochthodromus wilsonius (Ord) ‡ (Wilson's Plover). Great Bahama, Biminis, Little Abaco, New Providence, Andros, Concepcion Island, Acklin Island, Mariguana, Miraporvos, Rum Cay, Long Island, Little Pimlico, Great Inagua.

Arenaria morinella (Linné) (Eastern Turnstone). Great Bahama, Little Abaco, New Providence, Eleuthera, Andros, Green Cay, Cay Lobos, Watlings Island, Mariguana, Great Inagua.

Hæmatopus palliatus Temminck ‡ (American Oyster-catcher). Abaco, New Providence, Andros, Flemings Key, Long Island, Mariguana, North Caicos, Grand Caicos, East Caicos, Great Inagua.

Columba leucocephalia Linné ‡ (White-crowned Pigeon). Abaco, Biminis, Berry Islands, New Providence, Andros, Grassy Cays (Andros), Green Cay, Cay Lobos, Eleuthera, Cat Island, Buenavista Cay (Ragged Island), Long Rock (Exuma), Watlings Island, Long Island, Mariguana, North Caicos, Grand Caicos, East Caicos.

Zenaidura macroura (Linné) ‡ (Mourning Dove). Abaco, Eleuthera, New Providence, Bird Rock, Long Island.

Zenaida zenaida (Bonaparte) ‡ (Zenaida Dove.) Great Bahama, Abaco, New Providence, Andros, Eleuthera, Cat Island, Rum Cay, Watlings Island, Concepcion Island, Long Island, North Caicos, Grand Caicos, East Caicos, Great Inagua.

Melopelia leucoptera (Linné) (White-winged Dove). Great Inagua.

Columbigallina passerina bahamensis (Maynard) †‡ (Bahama Ground Dove). Great Bahama, Abaco, Little Abaco, Biminis, Berry Islands, New Providence, Andros, Green Cay, Eleuthera, Current Island, Cat Island, Concepcion Island, Rum Cay, Watlings Island, Long Island, Acklin Island, Plana Cays, Bird Rock.

Geotrygon chrysia Salvadori ‡ (Key West Quail-Dove). Great Bahama, New Providence, Eleuthera.

Order Falconiformes (Diurnal Birds of Prey).

Cathartes aura (Linné) ‡ (Turkey Vulture). Great Bahama, Abaco, Little Abaco, Andros.

Buteo borealis (Gmelin)[16] ‡ (Red-tailed Hawk). Abaco, Little Abaco, New Providence, Andros, Great Inagua.

Pandion haliaëtus ridgwayi (Maynard) †‡ (Bahama Osprey). New Providence, Andros, Water Cay (Ragged Islands), Long Island, Acklin Island, North Caicos, Grand Caicos, East Caicos, Great Inagua.

Falco peregrinus anatum (Bonaparte) (Duck Hawk). New Providence, Watlings Island, Great Inagua.

Falco columbarius Linné (Pigeon Hawk). Abaco, New Providence, Andros, Watlings Island.

Cerchneis sparveria (Linné). New Providence, Great Stirrup Cay.

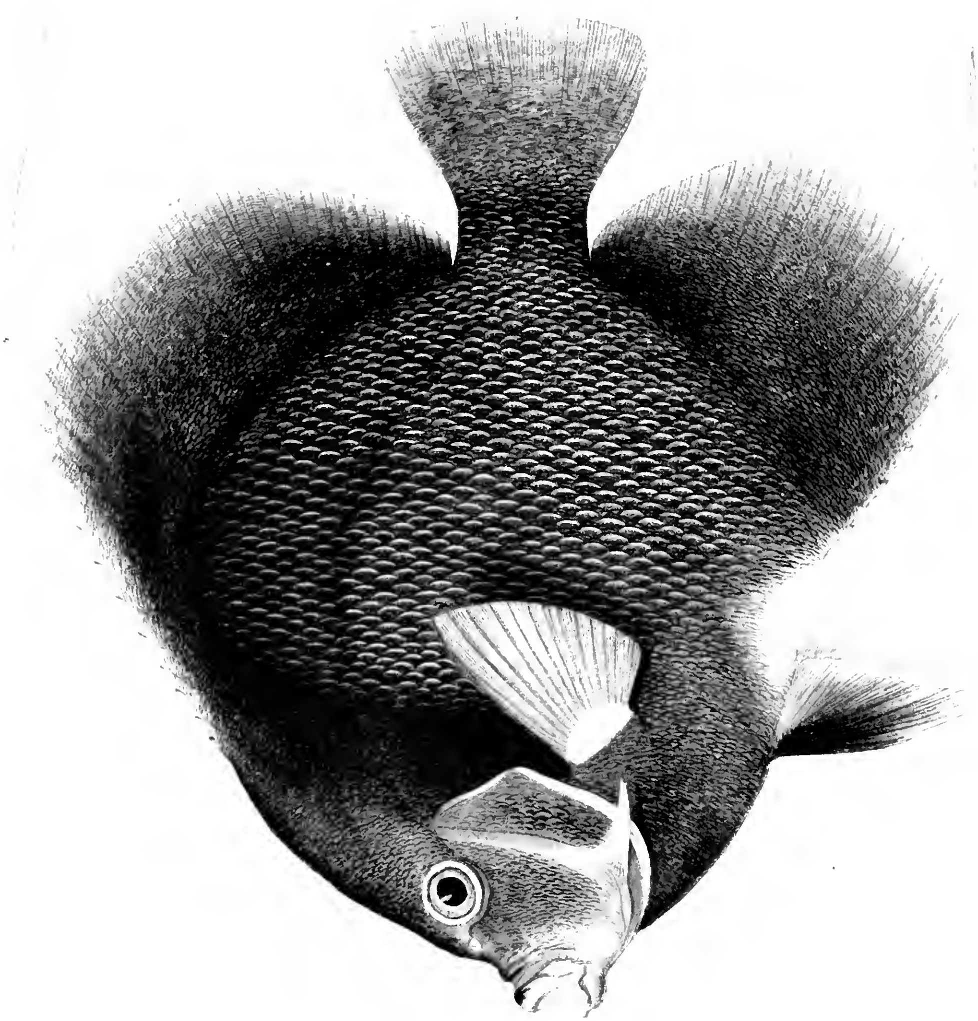
Accipiter velox (Wilson) (Sharp-shinned Hawk). New Providence.

Circus hudsonius (Linné) (Marsh Hawk). New Providence, Great Inagua.

[14] Dr. Bryant says it is resident.

[15] Possibly breeds.

[16] This probably belongs to the form described by Mr. O. Bangs as *Buteo borealis umbrinus* from southern Florida.



Pomacanthus arcuatus (Linnaeus)
BLACK ANGEL FISH
7/9 NATURAL SIZE

A. H. BALDWIN, ad nat. del.

A. HOEN & CO., Lith.

Order STRIGIFORMES (Nocturnal Birds of Prey).

Speotyto cunicularia cavicola Bangs †‡ (Nassau Burrowing Owl). New Providence, Eleuthera (?), Andros (?), Cay Sal (?).

Speotyto cunicularia bahamensis Cory †‡ (Inagua Burrowing Owl). Great Inagua, Great Exuma (?), Samana Cay (?).

Strix pratincola Bonaparte ‡ (American Barn Owl). Abaco, New Providence, Andros, Great Inagua.

Order CUCULIFORMES (Parrots and Cuckoos).

Amazona leucocephala bahamensis (Bryant) †‡ (Bahama Parrot). Abaco, Fortune Island, Acklin Island, Great Inagua.

Crotophaga ani Linné ‡ (Ani). Great Bahama, Abaco, Biminis, Berry Islands, New Providence, Eleuthera, Current Island, Andros, Cay Lobos, Rum Cay, Watlings Island, Long Island, Fortune Island, North Caicos, Grand Caicos, East Caicos.

Saurothera bahamensis Bryant †‡ (Nassau Lizard Cuckoo). New Providence, Eleuthera.

Saurothera andria Miller †‡ (Andros Lizard Cuckoo). Andros.

Coccyzus americanus (Linné) ‡ (Yellow-billed Cuckoo). New Providence, Cay Sal, Bird Rock, Watlings Island, Anguilla, Great Inagua.

Coccyzus minor maynardi (Ridgway) ‡ (Maynard's Cuckoo). Berry Islands, Eleuthera, New Providence, Andros, Cay Lobos, Watlings Island, Rum Cay, Long Island, North Caicos, Grand Caicos, East Caicos, Great Inagua.

Order CORACIIFORMES (Kingfishers, Woodpeckers, etc.).

Ceryle alcyon (Linné)[17] (Belted Kingfisher). Abaco, Biminis, Berry Islands, Eleuthera, New Providence, Andros, Green Cay, Mariguana.

Dryobates villosus maynardi Ridgway †‡ (Bahaman Hairy Woodpecker). Great Bahama, Abaco, Little Abaco, New Providence, Andros.

Sphyrapicus varius (Linné) (Yellow-bellied Sapsucker). Great Bahama, Abaco, Little Abaco, Biminis, Eleuthera, New Providence, Cay Lobos, Andros, Rum Cay, North Caicos, Grand Caicos, East Caicos, Great Inagua.

Centurus superciliaris nyeanus (Ridgway) †‡ (Nye's Woodpecker). Watlings Island.

Centurus superciliaris blakei (Ridgway) †‡ (Abaco Woodpecker). Abaco.

Centurus superciliaris bahamensis (Cory) †‡ (Great Bahama Woodpecker). Great Bahama.

Antrostomus carolinensis (Gmelin) (Chuck-will's Widow). New Providence, Andros, Great Inagua.

Chordeiles virginianus vicinus Riley †‡ (Bahama Nighthawk). Great Bahama, Abaco, New Providence, Eleuthera, Andros, Watlings Island, Long Island, Fortune Island, Acklin Island, Great Inagua.

Trochilus colubris Linné (Ruby-throated Hummingbird). New Providence.

Doricha evelynæ (Bourcier) †‡ (Bahama Wood-star). Abaco, Biminis, Berry Islands, Eleuthera, Current Island, New Providence, Andros, Green Cay, Cay Sal, Cay Lobos, Cat Island, Concepcion Island, Rum Cay, Watlings Island, Long Island, Acklin Island, North Caicos, Grand Caicos, East Caicos, At Sea.

[17] I was told upon reliable authority that this species is resident.

Doricha lyrura Gould †‡[18] (Inagua Wood-star). Great Inagua.
Riccordia ricordii bracei (Lawrence) †‡ (Brace's Hummingbird). New Providence. Known only from the type.
Riccordia ricordii aeneoviridis (Palmer & Riley) †‡ (Abaco Hummingbird). Abaco, Little Abaco, Andros (?), Great Bahama (?).

Order Passeriformes (Perching Birds).

Tyrannus dominicensis Gmelin ‡ (Gray Kingbird). Great Bahama, Abaco, Biminis, Berry Islands, Eleuthera, New Providence, Andros, Green Cay, Cay Sal, Cay Lobos, Exuma Cays, Concepcion Island, Long Island, Watlings Island, Cat Island, Rum Cay, Acklin Island, Mariguana, Great Inagua.
Tyrannus cubensis Richmond ‡ (Cuban Kingbird). North Caicos, Grand Caicos, East Caicos, Great Inagua.
Pitangus bahamensis Bryant †‡ (Bahama Flycatcher). Great Bahama, Abaco, Little Abaco, New Providence, Andros.
Myiarchus lucaysiensis (Bryant) †‡ (Bahama Crested Flycatcher). Great Bahama, Abaco, Little Abaco, Berry Islands, Eleuthera, New Providence, Andros, Green Cay, Crooked Island, Acklin Island, Great Inagua.
Blacicus bahamensis (Bryant) †‡ (Bahama Pewee). Great Bahama, Abaco, Little Abaco, Eleuthera, New Providence, Andros.
Empidonax virescens Vieillot (Green-crested Flycatcher). Accidental on Cay Lobos.
Mimus polyglottos orpheus (Linné) ‡ (Antillean Mockingbird). Great Bahama, Abaco, Little Abaco, Biminis, Berry Islands, New Providence, Andros, Concepcion Island, Great Inagua.[19]
Mimus gundlachi Cabanis †‡ (Gundlach's Mockingbird). Rum Cay, Watlings Island, Long Island, Exuma Cays, Concepcion Island, Mariguana, North Caicos, Grand Caicos, East Caicos, Great Inagua. Apparently only accidental on the Cuban Cays.
Mimus gundlachi bahamensis (Bryant) †‡[20] (Bryant's Mockingbird). Berry Islands, Eleuthera, Hog Island (off Great Abaco), New Providence, Andros, Ship Channel Cays, Green Cay, Cat Island, Highborn Cay.
Galeoscoptes carolinensis (Linné) (Catbird). Great Bahama, Abaco, Little Abaco, Biminis, Berry Islands, Eleuthera, New Providence, Andros, Green Cay, Rum Cay, Watlings Island, Great Inagua.
Margarops fuscatus (Vieillot) ‡ (Pearly-eyed Thrush). Rum Cay, Watlings Island, Long Island, Mariguana, North Caicos, Grand Caicos, East Caicos, Bird Rock, Great Inagua.
Hylocichla fuscescens Stephens (Wilson's Thrush). Accidental on Cay Lobos.
Hylocichla aliciæ bicknelli (Ridgway) (Bicknell's Thrush). Cay Sal.
Hylocichla mustelina (Gmelin) (Wood Thrush). New Providence, Cay Lobos.
Mimocichla plumbea (Linné) †‡ (Plumbeous Thrush). Great Bahama, Abaco, Little Abaco, Eleuthera, New Providence, Andros, Cat Island.
Polioptila cærulea (Linné) (Blue-gray Gnatcatcher). Bahamas in winter.

[18] Gould says that he supposed his type came from Long Island from Dr. Bryant having visited that island and having received the type from the Bryant collection. Dr. Bryant also spent considerable time on Great Inagua, the only island where apparently the species has been taken subsequently.

[19] Birds from this island have been named *M. elegans* by Dr. Sharpe.

[20] Mr. Ridgway has discriminated this form.

Polioptila cœrulea cœsiogaster Ridgway ‡ (Bahama Gnatcatcher). Abaco, New Providence.

Sitta pusilla Latham ‡ (Brown-headed Nuthatch). Great Bahama.

Corvus nasicus Temminck (Cuban Crow). Grand Caicos.

Ampelis cedrorum (Vieillot) (Cedar Waxwing). Berry Islands, New Providence.

Vireosylva calidris barbatula (Cabanis) ‡ (Black-whiskered Vireo). Abaco, Biminis, New Providence, Eleuthera, Current Island, Andros, Green Cay, Cay Lobos, Bird Rock, Long Island, Samana.

Vireosylva olivacea (Linné) (Red-eyed Vireo). New Providence, Cay Lobos, Watlings Island, Great Inagua.

Lanivireo flavifrons (Vieillot) (Yellow-throated Vireo). New Providence, Cay Lobos, Andros.

Vireo crassirostris (Bryant) †‡ [21] (Thick-billed Vireo). Abaco, Eleuthera, New Providence, Highborn Cay, Andros, Green Cay, Pimlico Cay, Cat Island, Great Inagua.

Vireo crassirostris flavescens Ridgway †‡ (Concepcion Vireo). Eleuthera, Green Cay, Long Island, Cat Island, Concepcion Island, Rum Cay, Great Inagua.

Lanius ludovicianus Linné (Loggerhead Shrike). Accidental on Andros.

Hirundo erythrogaster Boddært (Barn Swallow). Green Cay, Cay Sal, Mariguana, Little Inagua, Great Inagua, Anguilla.

Callichelidon cyaneoviridis (Bryant) †‡ (Bahama Swallow). Great Bahama, Abaco, Berry Islands, New Providence, Andros, Cay Sal, Current Island, Anguilla.

Mniotilta varia (Linné) (Black and White Warbler). Great Bahama, Abaco, Biminis, Berry Islands, Eleuthera, New Providence, Andros, Cay Lobos, Cay Sal, Green Cay, Watlings Island, Rum Cay.

Protonotaria citrea (Boddært) (Prothonotary Warbler). New Providence.

Helinaia swainsoni (Audubon) (Swainson's Warbler). Cay Lobos.

Helmitheros vermivorus (Gmelin) (Worm-eating Warbler). New Providence, Cay Lobos, Great Inagua.

Helminthophila pinus (Linné) (Blue-winged Warbler). Abaco.

Helminthophila bachmani (Audubon) (Bachman's Warbler). Cay Sal.

Compsothlypis americana (Linné) [22] (Parula Warbler). Great Bahama, Biminis, Berry Islands, Eleuthera, New Providence, Andros, Green Cay, Cay Lobos, Cay Sal, Watlings Island, Rum Cay, North Caicos, Grand Caicos, East Caicos, Great Inagua.

Dendroica tigrina (Gmelin) (Cape May Warbler). Abaco, Little Abaco, Biminis, Berry Islands, Eleuthera, Current Island, New Providence, Andros, Green Cay, Cay Lobos, Watlings Island, Rum Cay, Great Inagua.

Dendroica petechia flaviceps Chapman †‡ (Bahama Yellow Warbler). Great Bahama, Abaco, Little Abaco, Eleuthera, New Providence, Andros, Exuma Cays, Concepcion Island, Watlings Island, Rum Cay, Long Island, Acklin Island, Mariguana, North Caicos, Grand Caicos, East Caicos, Great Inagua.

Dendroica cœrulescens (Gmelin) (Black-throated Blue Warbler). New Providence, Andros, Cay Lobos, Concepcion Island, Watlings Island, Anguilla, Great Inagua.

Dendroica coronata (Linné) (Myrtle Warbler). Great Bahama, Abaco, Little Abaco, Biminis, Berry Islands, Eleuthera, New Providence, Andros, Cay Sal, Cay Lobos, Rum Cay, North Caicos, Grand Caicos, East Caicos, Great Inagua.

[21] Intermediate between *V. crassirostris* and *V. c. flavescens*, have been taken on New Providence, Eleuthera, Andros, Cat Island, Rum Cay, Long Island.

[22] It is quite probable that *C. a. usneæ* also winters in the Bahamas, but specimens in winter plumage are difficult to distinguish.

Dendroica maculosa (Gmelin) (Magnolia Warbler). Eleuthera, New Providence, Watlings Island.

Dendroica pennsylvanica (Linné) (Chestnut-sided Warbler). New Providence.

Dendroica cærulea (Wilson) (Cerulean Warbler). Cay Lobos.

Dendroica striata (Forster) (Black-poll Warbler). New Providence, Cay Lobos, Bird Rock, Anguilla, Watlings Island, Great Inagua.

Dendroica blackburniæ (Gmelin) (Blackburnian Warbler). New Providence, Watlings Island.

Dendroica dominica (Linné) ‡ (Yellow-throated Warbler). Great Bahama, Abaco, Biminis, Berry Islands, New Providence, Andros, Cay Lobos, Watlings Island, Mariguana, Great Inagua. (Resident and migratory.)

Dendroica virens (Gmelin) (Black-throated Green Warbler). Watlings Island.

Dendroica kirtlandi Baird (Kirtland's Warbler). Abaco, Little Abaco, Berry Islands, Eleuthera, New Providence, Andros, Green Cay, Watlings Island, North Caicos, Grand Caicos, East Caicos, Athels Island.

Dendroica pityophila bahamensis Cory †‡ (Bahama Warbler). Abaco, Great Bahama.

Dendroica vigorsii achrustera (Bangs) †‡ [23] (Nassau Pine Warbler). New Providence.

Dendroica vigorsii abacoensis Ridgway †‡ (Abaco Pine Warbler). Abaco.

Dendroica palmarum (Gmelin) (Palm Warbler). Great Bahama, Abaco, Biminis, Berry Islands, Eleuthera, New Providence, Andros, Green Cay, Cay Lobos, Cay Sal, Exuma Cays, Cat Island, Concepcion Island, Watlings Island, Rum Cay, Fortune Island, North Caicos, Grand Caicos, East Caicos, Great Inagua.

Dendroica discolor (Vieillot) ‡ (Prairie Warbler). Great Bahama, Abaco, Little Abaco, Biminis, Berry Islands, Eleuthera, Current Island, New Providence, Andros, Green Cay, Sandy Cay, Cay Lobos, Exuma Cays, Cat Island, Concepcion Island, Watlings Island, Rum Cay, Mariguana, North Caicos, Grand Caicos, East Caicos, Great Inagua. (Migratory and resident.)

Seiurus aurocapillus (Linné) ‡ (Ovenbird). Great Bahama, Abaco, Biminis, Berry Islands, Eleuthera, New Providence, Andros, Green Cay, Cay Lobos, Cat Island, Watlings Island, Rum Cay, Long Island, North Caicos, Grand Caicos, East Caicos, Great Inagua. (Migratory; a few only remaining to breed.)

Seiurus noveboracensis (Gmelin) (Water-thrush). Great Bahama, Abaco, Little Abaco, Biminis, Eleuthera, New Providence, Cay Sal, Cay Lobos, Watlings Island, Great Inagua.

Seiurus noveboracensis notabilis (Ridgway) (Grinnel's Water-thrush). New Providence.

Seiurus motacilla (Vieillot) (Louisiana Water-thrush). Biminis, Berry Islands, Cay Lobos.

Oporornis agilis (Wilson) (Connecticut Warbler). New Providence, Cay Sal, Cay Lobos.

Geothlypis trichas (Linné) [24] (Maryland Yellow-throat). Eleuthera, Abaco, New Providence, Green Cay, Watlings Island, Concepcion Island, Rum Cay, Cat Island.

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[23] Some undetermined form of *Dendroica vigorsii* has been recorded also from Great Bahama, Andros, and Cay Sal.

[24] Undetermined forms of *G. trichas* have been recorded from Great Bahama, Biminis, Berry Islands, Andros, Cay Sal, Cay Lobos, Anguilla, Great Inagua.

Geothlypis trichas brachidactyla (Swainson) (Northern Yellow-throat). Abaco, Eleuthera, New Providence, Hog Island, Cay Sal, Rum Cay.

Geothlypis rostrata Bryant †‡ (Bryant's Yellow-throat). New Providence.

Geothlypis maynardi Bangs †‡ (Maynard's Yellow-throat). New Providence.

Geothlypis tanneri Ridgway †‡ (Tanner's Yellow-throat). Abaco, Little Abaco (?), Great Bahama (?).

Geothlypis incompta Ridgway †‡ (Lesser Abaco Yellow-throat). Abaco.

Geothlypis exigua Ridgway †‡ (Andros Yellow-throat). Andros.

Geothlypis coryi Ridgway †‡ (Cory's Yellow-throat). Eleuthera.

Geothlypis flavida Ridgway †‡ (Luteus Yellow-throat). New Providence, Andros.[25]

Wilsonia mitrata (Gmelin) (Hooded Warbler). Cay Lobos.

Setophaga ruticilla (Linné) (American Redstart). Great Bahama, Biminis, Berry Islands, New Providence, Andros, Green Cay, Cay Lobos, Concepcion Island, Long Island, Anguilla, Great Inagua, Turks Island.

Cæreba bahamensis (Reichenbach) †‡ (Bahama Bananaquit). Great Bahama, Abaco, Little Abaco, Biminis, Berry Islands, Eleuthera, Current Island, New Providence, Andros, Green Cay, Cay Lobos, Exuma Cays, Great Exuma, Cat Island, Concepcion Island, Watlings Island, Rum Cay, Long Island, Mariguana, North Caicos, Grand Caicos, East Caicos, Little Inagua, Great Inagua, Highborn Cay.

Dolichonyx oryzivorus (Linné) (Bobolink). New Providence, Cay Lobos, Cay Sal, Watlings Island, Anguilla, Great Inagua.

Agelaius phœniceus bryanti Ridgway ‡ (Bahama Redwing). Great Bahama, Abaco, Little Abaco, Biminis, Berry Islands, New Providence, Andros, Cay Sal.

Icterus northropi Allen †‡ (Northrop's Oriole). Abaco, Andros.

Piranga rubra (Linné) (Summer Tanager). New Providence, Andros.

Piranga erythromelas (Vieillot) (Scarlet Tanager). New Providence, Andros, Cay Lobos.

Spindalis zena (Linné) †‡ (Black-backed Spindalis). Berry Islands, Eleuthera, New Providence, Andros, Green Cay, Cat Island, Long Island, Mariguana.

Spindalis zena townsendi Ridgway †‡ (Abaco Spindalis). Abaco, Little Abaco.

Zamalodia ludoviciana (Linné) (Rose-breasted Grosbeak). Watlings Island.

Cyanospiza ciris (Linné) (Painted Bunting). Great Bahama, Berry Islands, New Providence.

Cyanospiza cyanea (Linné) (Indigo Bunting). New Providence, Cat Island, Cay Lobos.

Pyrrhulagra violacea (Linné) †‡ (Bahama Bullfinch). Great Bahama, Abaco, Little Abaco, Berry Islands, Eleuthera, Current Island, New Providence, Andros, Highborn Cay, Cat Island, Long Island, Acklin Island, North Caicos, Grand Caicos, East Caicos, Great Inagua.

Tiaris bicolor (Linné) †‡ (Bahama Grassquit). Great Bahama, Abaco, Biminis, Berry Islands, Eleuthera, New Providence, Andros, Green Cay, Cat Island, Great Exuma, Concepcion Island, Watlings Island, Rum Cay, Long Island, Crooked Island, Fortune Island, Acklin Island, Mariguana, North Caicos, Grand Caicos, East Caicos, Little Inagua, Great Inagua.

Passerculus sandwichensis savanna (Wilson) (Savannah Sparrow). Great Bahama, Abaco, Little Abaco, New Providence, Andros, Green Cay, Rum Cay.

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[25] Specimen in collection of G. S. Miller, Jr., from Andros (*fide* Mr. Ridgway).

Ammodramus savannarum passerinus Wilson (Grasshopper Sparrow). Biminis, New Providence, Andros, Cay Lobos, Cay Sal.

Passer domesticus (Linné) (House Sparrow). New Providence. (Introduced.)

NOTES.

Catesby records *Guara rubra* from the Bahamas; there are apparently no later records.

Iridiprocne bicolor has been recorded from New Providence, but as the immature *Callichelidon cyaneoviridis* so closely resembles it, the record is open to doubt.

MAMMALS OF THE BAHAMA ISLANDS

MAMMALS OF THE BAHAMA ISLANDS

BY

GERRIT S. MILLER, Jr.,

Assistant Curator, Division of Mammals, U. S. National Museum.

INTRODUCTION.

On Wednesday, October 17, 1492, some of Columbus's men are reported to have seen "dogs, mastiffs, and hounds," which belonged to the inhabitants of Long Island, then Fernandina, Bahamas.[1] Fernandina was the third island visited by the explorers, and these dogs, the first animals other than fish and birds mentioned in the journal of the voyage, are the first American mammals recorded by Europeans. No strictly wild mammals were seen by Columbus in this group of islands, as he did not become acquainted with hutias until after he arrived in Cuba. Even at this time, therefore, the Bahamas seem to have been almost destitute of conspicuous mammalian life, while now, after the lapse of four centuries, we know only eight mammals whose presence on the Islands is not certainly due to man. This paucity of information is partly due to the undoubted absence of many species that occur in the Greater Antilles, but it is due even more to the fact that the collectors who have visited the Islands have given very little attention to the mammals.[2] Under these circumstances a list of the mammals of the Bahamas must be more a record of ignorance than a record of facts; ignorance which is surprising when we recall that on these same Islands Columbus saw the first mammals of the New World.

The most important collection of Bahama mammals is that made by Mr. J. H. Riley and Mr. S. H. Derickson, while accompanying the Expedition of the Geographical Society of Baltimore in the summer of 1903. This contains over two hundred specimens, one hundred and eighty-five of which are now in the U. S. National Museum, representing six of the ten species known

[1] The Journal of Christopher Columbus (during his first voyage, 1492-1493), p. 50. Hakluyt Society, London, 1893.

[2] Mammals have been collected on about one-fourth of the islands of the group: Andros, Eleuthera, Little Abaco, Long Island, New Providence, Plana Keys, and Watlings Islând.

to occur wild on the Islands. The present paper is based chiefly on this material, but I have made use of all other specimens and records which I have found available.[a] As already intimated, this list must be regarded as a mere fragment, too imperfect to form the basis of any generalizing as to the origin and exact affinities of the mammal fauna as a whole. It has been prepared chiefly with the hope that it may stimulate and aid further work.

ANNOTATED LIST OF SPECIES.

A discussion of the mammals which have thus far been discovered in the Bahama Islands will now be given.

RATS.

Mus alexandrinus Geoffroy.

Mus alexandrinus Geoffroy, 1818, Description de l'Egypt, Mammiferes, p. 733.

An Old World rat now abundantly introduced and established in the warmer parts of America.

The roof rat probably occurs on all of the inhabited islands. The only specimen that I have seen was taken on New Providence by C. J. Maynard (Miller collection), who writes: "This is the common house rat of Nassau, and I have always found them common in the city houses. I was once bitten on the finger by one when I was asleep."

A rat that may have been this species or the next, is mentioned by Mr. Riley: "Mr. Derickson shot a young specimen of a long-tailed rat, which I supposed to be the roof rat, in the pines near Lake Killarney, New Providence. It was in the woods, a mile or more away from any dwellings."

Mus rattus Linné.

Mus rattus Linné, 1758, Syst. Nat., i, 10th ed., p. 61.

The black rat is also an introduced species, now common in the warmer parts of America.

Of its occurrence in the Bahamas, I have no information other than that contained in the following note by Mr. Maynard: "Common in the scrub on New Providence. I obtained two that were living in holes of rocks about a mile back of the city of Nassau. I often saw them running about. In 1897, when on a trip among the keys, I noticed signs of rats on Flemings Key, and my boatmen told me that rats, presumably of this species, were very abundant

[a] I am particularly indebted to Mr. C. J. Maynard for elaborate notes on the species that have come under his observation.

on this island. It is an uninhabited key lying about twenty miles northeast from New Providence. They told me the following story about this key and its rats: 'A pilot who was taking a vessel out from Harbor Island, a port to the northward, was dropped on this key where he expected his friends to call for him. But they did not do so that day and he passed the night on the island. At nightfall he was surrounded by rats that gathered from all sides and attacked him. It was only by keeping on his feet all night and using a club vigorously that he managed to escape the bites of the fierce little rodents.' I did not find a single living mollusk on this key, nor did I see any land crabs there, and in confirmation of the story, did see quite a number of rats in the thick scrub."

MUS MUSCULUS Linné.

Mus musculus Linné, 1758, Syst. Nat. i, 10th ed., p. 62.

The house mouse is an Old World animal now introduced throughout the greater part of America.

I have seen no Bahama specimens, but Mr. C. J. Maynard writes: "Common everywhere in Nassau and about the settlements on New Providence. I once obtained a specimen that had nested in the hollow of a dead mangrove on Andros Island."

CAPROMYS.

CAPROMYS INGRAHAMI Allen.

Capromys ingrahami Allen, 1891, Bull. Amer. Mus. Nat. Hist., vol. iii, p. 329.

Eastern island of the Plana Keys. Related species occur in the Greater Antilles on Swan Island and in Venezuela.

The Bahama hutia, though probably known to the earlier explorers of the West Indies, was not technically described until 400 years after the Islands were discovered. Whether *Capromys ingrahami* has always been confined to the limited area that it now occupies is purely a matter of conjecture. There is good reason to doubt its supposed occurrence on Mariguana, and Mr. Riley found no traditions of its presence on other islands.

Dr. Allen's account of the animal is so interesting that much of it may be quoted. After describing the species,[4] he introduces Dr. Ingraham's field notes:

"On the morning of February 11, 1891, we anchored under the lee of the easternmost of the Plana Keys, in latitude about 22° 33′ north, longitude

[4] Loc cit., pp. 331-332.

72° 30′ west, and about half-way between the northeast point of Acklin Island and Mariguana of the Bahamas; and on going on shore we saw unmistakable signs of the little rodent known among the natives as the 'Hootie' [= Hutia].

"The key is a small rocky islet, the highest point of which is probably not more than fifty feet above the surrounding ocean, with crevices and caves worn in the rocks by the action of water, and in many places broken strata of rocks piled upon each other, leaving cracks and crevices between and beneath them. The islet may be slightly more than half a mile wide and four or five miles long, entirely without fresh water except in the rainy season, when pools of fresh water may be found in the holes in the rocks. There is a small growth of shrubby bushes in the rocky crevices, and in some parts of the lower ground a growth of black buttonwood, and on the western end of the islet a light growth of the silver-leaved palm, with here and there different forms of cacti scattered over the island. A few paw-paw trees were also found where the seeds had evidently been dropped. About a mile and a half west of the key is another small key, of about the same size and of the same geological formation, but separated from it by a deep passage. This is the only land within twenty miles or more, and my sailing charts indicate a depth of water of several thousand feet.

"Although these islands are only about a mile and a half apart, their fauna is very distinct outside of a small lizard common to all of the rocky islands of that part of the Bahamas.

"The 'Hootie' [Hutia] occupies only the eastern island, which, with the lizard and a few varieties of birds, constitutes its entire [vertebrate] fauna. Neither am I able to learn of its being found in any other portion of the Bahamas.

"During my stay of two weeks, weather bound, under the lee of the island, I secured about twenty specimens of this animal, which at first I thought was gregarious in its habits, or inclined to live in colonies, but the occurrence of so many individuals at this point may have been due to the favorable conditions of the locality for affording it hiding places. I once saw quite a number together away from the rocks, among the palmettos, but on a subsequent visit to the island I came to the conclusion that the gathering was on account of its being about the rutting season. Its food was the leaves, twigs and bark of the bushes, especially the black buttonwood, and the succulent growth of the cactus plants. It seemed very fond of the fruit of the paw-paw, and even of the body of the tree itself, as I have seen the trunks of this tree,

Fig. 1.—Skull of Procyon lotor elucus Bangs, seen from above

Fig. 2.—Skull of Procyon lotor elucus Bangs, seen from below

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nearly as large as my body, eaten so nearly off that they would not sustain their own weight. A sweet potato left on the shore was eaten up, while the body of a bird, left to tempt them, was untouched.

"When wounded it seldom made any attempt to defend itself, although in one instance, when I put my foot on a wounded one, it tried to bite me. It feeds mostly by night, although found occasionally foraging during the day. I saw no indications of its burrowing, the numerous holes and crevices in the rocks perhaps rendering this unnecessary. In its movements and shape when running it reminded me very much of the Muskrat. It would run nearly as fast as I could. I had to shoot most of the specimens I obtained, but I secured a few, down in the palmettos, by chasing them and stamping on them, as they ran under the palmetto leaves. It was not shy, as when it was away from the rocks I could approach within twenty-five or thirty feet of it by moving cautiously when it would take to the rocks.

"I opened a number of the animals during my stay for the purpose of securing a fœtus for an alcoholic specimen, but failed to obtain any."

After discussing the animal's affinities, Dr. Allen continues:[5]

"The present is by no means the first record of *Capromys* from the Bahamas. Catesby's *Cuniculus bahamensis* is evidently one of the larger species of the genus, but which one, or whether really from the Bahamas, is at present beyond determination. Columbus, however, on his first voyage to the West Indies, evidently found some form of the genus abundant at nearly all of the several Bahama Islands he visited; and Mr. C. B. Cory informs me that 'a peculiar large rat, probably a *Capromys*,' is said to occur abundantly on the island of Mariguana, a few miles to the eastward of Plana Keys. Mr. Ingraham, however, replying to my inquiries on this point, writes me that he spent from the 22d of February to the 30th of March, 1891, at the island of Mariguana. He says: 'The island has a coast line of about seventy-five or eighty miles, and I have walked nearly or quite half of this distance. I have been four or five miles into the interior, and indeed there is not a part fifteen miles in extent that I have not visited. I saw no signs of *Capromys* anywhere on the island, nor did I hear of any such animal from the inhabitants, who, however, repeatedly told me of the "Hootie" on the Plana Keys. Hence I may say unhesitatingly that it is not found on the island of Mariguana.

"Mr. Ingraham, who has visited a large number of the keys and islands of the Bahama group, further informs me that he has never heard of the existence

[5] Loc cit., pp. 335-336.

of any similar animal elsewhere in the Bahamas. An animal so helpless and easily destroyed as the Hutia may, however, have formerly existed at many points in the Bahamas and Antilles, where it is now extinct.

"The first European explorers of the West Indies found these peculiar rat-like animals abundant in various parts of the Antilles, and vague descriptions of them were given under their various native names by the writers of the sixteenth and seventeenth centuries, notably by Oviedo in his 'Historia general de las Indias,' published in 1547, and later by Rochefort, Duturtre, and Browne. As these little beasts were in great quest as food, from the delicacy of their flesh, by both the natives and the Spanish colonists, they quickly began to become scarce, a fact noted even by Oviedo, who says they were hunted by dogs brought from Spain. They were so common in Jamaica at the time of Columbus's visit that he is said to have 'victualled the famous canoe expedition of Diego Mendez with them.'[6] The narrators of his voyage make frequent mention of their abundance not only in the Bahamas and at Jamaica, but also in Cuba and Hispaniola. Oviedo speaks of three kinds, and later writers mentioned others, without, however, describing them so as to give a very clear conception of their characters. They have been referred to as occurring throughout the Greater Antilles, except in Porto Rico, and in the Bahamas. The earlier natural history compilers introduced them into their works, greatly to the distraction of later systematic writers.

"Although these animals are apparently still not uncommon at certain localities on the larger islands, they have doubtless everywhere greatly decreased in numbers, and probably at many points have been wholly extirpated. Though said to be still common in Hayti and San Domingo, and in portions of Cuba, they have been practically exterminated in Jamaica. Specimens, however, are very rare in collections, and even at this late day our knowledge of the group is very inexact, while some of the forms have doubtless already become extinct."

RACCOONS.

Procyon maynardi Bangs.

Procyon maynardi Bangs, 1898, Proc. Biol. Soc. Wash., vol. xii, p. 92.

An animal of North American affinities. It was unquestionably introduced from the mainland, but it is now known from New Providence only.

An adult male of the Bahama raccoon was brought to Mr. Riley on June 23, 1903, at Nassau. The animal is fully adult, though not aged. (Plate

[6] Zool. Journ., Vol. IV, 1829, p. 277.

LXIII, Figs. 1-2.) Its measurements are: Total length, 713; tail vertebræ, 240; hind foot, 100 (95); skull, greatest length, 107; basal length, 99; basilar length, 94; length of palate (median), 61; width of palate between middle of carnassials, 18.6; length of palatine extension behind molars (to tip of hamular), 26; least width of palatine extension, 12.6; zygomatic breadth, 69; least interorbital breadth, 22; breadth of braincase above roots of zygomata, 44.6; mastoid breadth, 54; mandible, 75; maxillary toothrow to front of canine (alveoli), 38.6; crown of first upper molar, 7.8 x 8.8; mandibular toothrow to front of canine (alveoli), 45.2; crown of first lower molar, 9 x 6. (Specimen number 121,905.)

Though undoubtedly introduced from the mainland this animal is unlike any raccoon with which I have been able to compare it. In general it resembles *Procyon pygmaeus* Merriam (Plate LXIV, Figs. 1-2), but it is not as diminutive; its teeth, particularly the posterior lower molar, are not as small, and its color differs from that of the Cozumel animal in the conspicuously whitish muzzle, less gray occiput, and less dark gular area back of the whitish chin. The audital bullæ are much larger than in *P. pygmaeus* Merriam, and their outer ventral surface is nearly flat instead of deeply concave. The comparative size of *Procyon maynardi*, from Nassau, *P. pygmaeus* Merriam, from Cozumel, and *P. lotor elucus* Bangs, from Florida is shown by the photographs of skulls reproduced on Plates LXII-LXIV.

Mr. Maynard gives the following account of his experience with this animal: "As early as 1884, I was aware that there was a Raccoon on New Providence, and that year obtained a flat skin of the species; but it was not until 1897, that I succeeded in obtaining an entire specimen. About June 1, of this year, a living female Raccoon was brought to me by a man who had captured her in the pine woods on the south shore of New Providence. The animal had been injured on the head, having evidently been stunned by a blow, and probably as a consequence of this blow did not eat anything for a week. After this she slowly recovered and soon ate readily. She appeared uneasy in captivity and was always trying to climb to some elevated place, and at length escaped. She was recaptured, however, by some one, and I recovered her in about a week. On June 16, she appeared even more uneasy, but was rather less wild, even permitting me to handle her. The next morning I found a single young one with her in her box. This was a female entirely naked, with the exception of a little fine hair on the back, which was of a reddish color. Although of course of a different form, the little animal was about the size of a

half-grown Norway rat. Its eyes were closed. The mother handled her offspring with her paws and mouth. From the first the mother would permit me to take the little one in my hands without showing the slightest objection. I brought both of the Raccoons in safety to my home in Newtonville, Massachusetts, early in July. The young one did not open its eyes until the middle of this month, almost exactly thirty days from its birth, and continued very helpless up to that time. The hair had gradually grown, and when it began to see it was so well covered that it began to show some of the characteristic markings of the adult, but it was much darker in color. From the first the Raccoons occupied a good sized room where they could climb about, and the young one, which we named "June," soon became very expert; even more so than the mother, for she could walk up the side of a wall, some eight feet high, which was, however, made of unplaned boards. June was at this time very playful and delighted in romping with a young kitten of about her size. She was also fond of playing with two skunks that were kept in the same room with the Raccoons. This sportiveness was not always fully appreciated by the more sedate skunks. They especially objected to having their long, bushy tails pulled by their agile young friend, and two or three times, when so treated, so far forgot their usual good behavior as to remonstrate in a manner that must have completely astonished the little "coon." I think, however, she was always quick enough to escape the fetid discharge, for I could never perceive any of the skunky odor on her. I may say in passing that either owing to the food with which these skunks were fed, or possibly due to the fact that they were both females, or to some other cause, the odor of the discharges was not as strong as that usually emitted by wild skunks. The room in which the animals were kept was in a barn, and the floor was covered with straw, yet all traces of the odor disappeared in two or three days. During the winter of 1897-98, the Raccoons were kept in a room in which there was a fire night and day. The next summer they were permitted complete freedom of the barn, out of which they soon found a way to the open air. They never went far from the buildings. The next winter, as they could not be caught, they were without a fire, and sometime that season the old one disappeared. Presumably she died from cold. June, however, developed a thick coat of hair and fur and is now (April, 1904), alive and well, having passed through even the extreme cold last winter without any fire in the building in which she lives. She is now nearly eight years old. She attained her present size when she was two years of age, but she is not as large as her mother and has always been considerably darker in color."

FIG. 1.—SKULL OF PROCYON MAYNARDI BANGS, SEEN FROM ABOVE

FIG. 2.—SKULL OF PROCYON MAYNARDI BANGS, SEEN FROM BELOW

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Mr. Riley's notes on this raccoon are as follows: "Raccoons were said to be abundant on New Providence and we saw a number of tracks in a mangrove swamp about twelve miles west of Nassau. They are said to be very destructive to sweet potatoes and other crops, in fact a nuisance. Though I offered to buy a series and pay a good price, only one poor specimen was brought off to the ship. The natives said they needed good dogs to tree them and there seemed to be only one man who possessed this desideratum. The chase must be attended with considerable danger, as the going is bad enough in the day-time over rotten coral rock or ground full of pot-holes, and I shudder to think what it must be at night. I was informed by everyone that I conversed with on the subject, that there is a tradition that this animal had been introduced by one of the large plantation owners many, many years ago, but from where there seemed to be complete uncertainty. I was told Florida, but this seemed to be only a conjecture."

BATS.

VESPERUGO FUSCUS BAHAMENSIS, Miller.

Vesperugo fuscus Allen, 1890, Bull. Amer. Mus. Nat. Hist., vol. iii, p. 169. Not *Vespertilio fuscus* Beauvois.

Vespertilio fuscus bahamensis Miller, 1897, North American Fauna, No. 12, p. 101.

Known from New Providence only. The group to which the species belongs is almost cosmopolitan.

The series of twelve skins procured by Mr. Riley, makes possible a comparison of the color of this bat with that of *V. fuscus* Allen. While some individuals are scarcely distinguishable, the Bahama animal averages noticeably more yellow, and the fur is more clouded by the dark bases of the hairs. There is no approach to the dark, rich color of the Cuban species.

Of the Bahama *Vespertilio*, Mr. Maynard writes: "On March 22, 1893, when in company with my friend, the late Geo. L. Curtiss, I visited the so-called dungeons of old Fort Charlotte, just to the westward of Nassau, we found a hole in the roof of one of them absolutely filled with bats. There were several hundred gathered there, clinging one to the other, much like swarming bees, occupying a space about the size of a bushel basket. Mr. Curtiss caught over seventy-five with one swoop of his insect net. We were told by the keeper of the fort that the bats were always in that same place in winter. On April 2, of the same year, I found a number of the same species in some caves near where I saw the leaf-nosed Bat, but did not find any of this latter-named species, either there or in the old locality at that time."

Mr. Riley seems to have found the animal in the exact locality where Mr. Maynard discovered it. He says: "This bat was quite common in one or two of the dark inner underground chambers, where the light never penetrated, of the old Spanish fort at Nassau. They had young at the time of our first visit (June 21), that were nearly as large as the adults. Though able to fly, the young seemed loath to do so, as when disturbed they tried to escape by scrambling away on all fours. We only found this species in the old fort."

Sixty-eight specimens (12 skins) were collected by Mr. Riley.

Lasiurus borealis (Miller).

Vespertilio borealis Müller, 1776, Natursyst. Suppl., p. 21.
Atalapha noveboracensis H. Allen, 1894, Monagr. Bats. N. Am.
Lasiurus borealis (Miller), 1897, North American Fauna, No. 13, p. 105.

Bats of this group are found almost throughout America, including the Greater Antilles.

A red bat taken on New Providence, February 2, 1884, by Mr. C. J. Maynard, has been recorded by Harrison Allen. As the specimen consisted of a skull only, no exact determination was possible.

Nyctinomus bahamensis Rehn.

Nyctinomus bahamensis Rehn, 1902, Proc. Acad. Nat. Sci. Phila., p. 641.

Peculiar to the Bahamas. A member of a tropical group ranging from the southern United States to Paraguay, and throughout the West Indies.

This bat was originally described from a specimen taken at Governors Harbor, Eleuthera, by Dr. J. Percy Moore, and six collected on Little Abaco by Mr. J. Lewis Bonhote. Mr. Riley procured sixty-one (61 skins) near Clarence Harbor, Long Island. His field notes are as follows: "This species was found in a rather light cave about a mile and a half back of Clarence Harbor, Long Island, and in the Hamilton cave, about five miles from the same town. They occupied the rounded holes in the roof that sometimes run up for unknown distances. The fact that on first entering a cave one sees no bats is therefore no indication that none are there, as these holes are so dark that even when a light is held near the opening it is often impossible to see the bats. This species could hardly be overlooked, as the caves it inhabited have a strong, disagreeable odor, peculiar to this genus, I am told. In the first try with a small dip net over seventy specimens were captured, all that we deemed the net could hold without tearing. In the Hamilton cave, the shot from a .32 collecting pistol into one of the holes, that on account of the

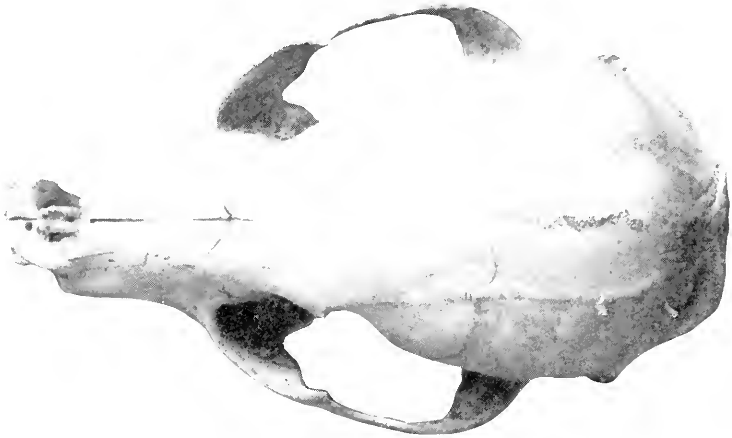

FIG. 1.—SKULL OF PROCYON PYGMÆUS MERRIAM, SEEN FROM ABOVE

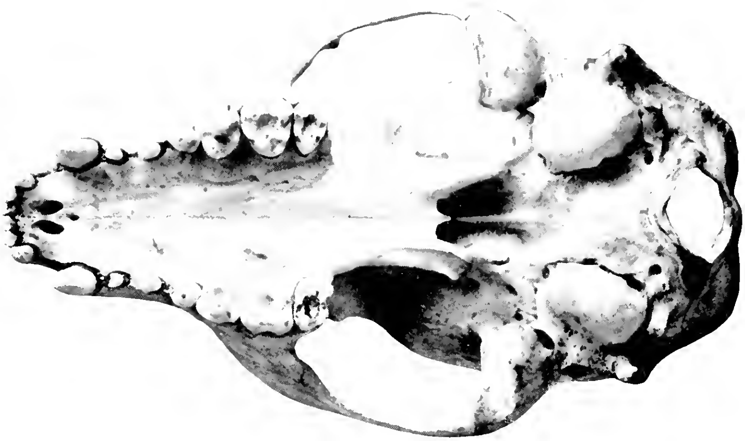

FIG. 2.—SKULL OF PROCYON PYGMÆUS MERRIAM, SEEN FROM BELOW

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high roof could not be reached with the net, brought down twenty-nine. In both caves they were not found far away from the entrance."

CHILONATALUS TUMIDIFRONS Miller.

Chilonatalus tumidifrons Miller, 1903, Proc. Biol. Soc. Wash., vol. xvi, p. 119.

This bat is known only from the seven specimens collected by Mr. Riley and Mr. Derickson. The genus occurs in Cuba, Jamaica and Old Providence.

Mr. Riley's notes are as follows: "About a dozen of this beautiful little species were found in a peculiar cave at Sandy Point, or near the south end of Watlings Island. The entrance to the cave was fifteen feet or more across, but only about three feet high. This passage extended back seventy-five feet or more, opening into a large chamber with a high roof. We had gone to the point to look for Nye's Woodpecker (*Centurus nyeanus*) and were not prepared for collecting bats, but when we heard of the cave, knowing from experience in Cuba that rarely ever two species inhabit the same cave and that the list of species can be materially swelled by visiting as many caves as possible, we determined to examine it. Our guide gathered a lot of rubbish and made a small fire in the center, when we were agreeably surprised to see a bat, entirely new to us, flitting about in the dim light, reminding one of a large moth. It soon became intolerable in the cave from the smoke and heat, as there was no outlet except the entrance. Together we secured seven specimens; the majority of those in the cave, but it was rather difficult shooting in the dim light and from the smallness of the bats. Two were secured that had been driven into the entrance, as they could be seen better here against the light. When we emerged from the cave and examined our specimens we surmised we had an undescribed form. When fresh, the gland or swelling on the rostrum is very prominent."

MACROTUS WATERHOUSII Gray.

Macrotus waterhousii Gray, 1843, Proc. Zool. Soc. London, vol. xi, p. 21.
Macrotus waterhousii Allen, 1890, Bull. Amer. Mus. Nat. Hist., vol. iii, p. 170.

A member of a wide ranging tropical American genus.

A specimen of the long-eared bat taken on Andros Island, was recorded by Dr. J. A. Allen, and another, from New Providence, has been for many years in the United States National Museum. Mr. Riley procured five near Georgetown, Eleuthera, and one on Long Island. In his field notes he says: "About a dozen of this species were found near the entrance to a large cave about four miles south of Georgetown, Eleuthera, the majority of which were

secured. These comprised adults and nearly grown young. A single specimen was found in a cave back of Clarence Harbor, Long Island."

The specific identity of this bat is in doubt, as I have had no opportunity to examine true *Macrotus waterhousii* Gray, from Haiti.

LONCHORHINA AURITA Tomes.

Lonchorhina aurita Tomes, 1863, Proc. Zool. Soc. London, p. 83.

The original specimen is supposed to have been taken in Trinidad.

Through the kindness of Mr. Witmer Stone, I have examined a specimen (Adult male No. 1770, Academy of Natural Science of Philadelphia), apparently the second known, of this very rare bat, taken in Nassau Harbor by H. C. Wood. Its measurements are: total length, 100; head and body, 54; tail, 46; tibia, 20.4; foot, 11; forearm, 50; first digit, 9; second digit, 43; third digit, 97; fourth digit, 71; fifth digit, 67; width of ear, 23; skull, greatest length, 9.6; zygomatic breadth, 11; least interorbital breadth, 5; breadth of braincase above roots of zygomata, 9; maxillary toothrow exclusive of incisors (alveoli), 7.

PHYLLONYCTERIS PLAINFRONS Miller.

Phyllonycteris plainfrons Miller, 1899, Proc. Biol. Soc. Wash., vol. xiii, p. 34.

Known only from the Bahamas. The genus is elsewhere confined to the Greater Antilles.

This species was based on one hundred and twenty-two alcoholic specimens collected on New Providence by Mr. James E. Benedict and two skins from the same island taken by Mr. C. J. Maynard. Subsequently Dr. Harris Kennedy procured others and presented them to the U. S. National Museum. Mr. Riley obtained the animals on New Providence, Eleuthera, and Long Island.

Mr. Maynard appears to have been the original discoverer of this bat. He writes of it: "On June 2, 1884, in company with Sir Henry A. Blake, Governor of the Bahamas, I visited a cave on the western shore of New Providence, about six miles from Nassau, and found the dome-like roof covered with pendent bats. We shot some ten or a dozen and found that eight had young clinging to them. One of the adults, a female, was apparently uninjured, but being heavy with young, had fallen among the rest. This bat was kept by Sir Henry and on the following day gave birth to a single young one. This was born hind feet first and was thus enabled to cling to its mother, who hung head downward, in the usual manner. I saw both bats the next day and observed that the young one kept trying to find the teat of the mother,

but did not succeed, nor could I then perceive any mammæ. Shortly afterward I left the island but, as I learned from Governor Blake, both mother and offspring died in a few days and the bodies were sent to me in alcohol. A careful post mortem examination failed to disclose any mammary glands or any trace of any, yet the bat was pregnant with another embryo which was well advanced. This bat is a fruit-eating species, and the specimen described ate sapodillos greedily."

Mr. Benedict has kindly furnished me with the following account of his experience with the species: "During the visit of the Albatross to the Bahamas, in the winter of 1884-1885, the Harbor-Master of Nassau, Capt. Lightbourn, informed Capt. Tanner, of the Albatross, that there was a cave practically unexplored and not very long known, several miles back from Nassau. An expedition was formed and several naturalists from the ship went with Captains Lightbourn and Tanner to the cavern, where, before entering, a change of clothing was made. The cave was well filled with a bat guano, which would quickly render clothing unfit for use until washed. The cave was entered, each man carrying two lighted candles. The party remained in the cave about three-quarters of an hour. At first the entrance was narrow and sometimes low. In one place we crossed a pit which may have led to caverns opening below, but we did not have time to investigate. After we had gone back some little distance, a very large number of bats flew about. They were shot with small guns at first, and then they were caught in the hands, without shooting. The hands were first covered with rubber gloves and the sharp teeth would penetrate the skin sufficiently to be felt, though they could do no harm. I penetrated a chamber where the bat guano was so thick it sounded hollow underneath. The cavern had been so filled at this point that there was barely room for a man to push himself on his knees and elbows into this chamber, but here the bats were especially numerous, and I found that it was often necessary to relight the candles. About one hundred bats were taken, and many hundreds must have remained, as no perceptible diminution in number could be observed. The exact location of this cave I cannot describe, and Capt. Lightbourn said that it was known to comparatively few people, though there was a much better known cave somewhere back of Nassau."

Mr. Riley's notes: "In an old out-building that had formerly been a part of the outer fortifications of the old Spanish fort at Nassau, now used as a sheep barn, we found the males of this species hanging by one foot to the roof in great numbers, June 21. The room was light enough to see the bats

very plainly without a lantern and we soon took all we cared for; but on revisiting this place again on July 2, not a bat could be found. We had first visited the interior of the fort where we took *Vespertilio bahamensis* and on inquiring if bats inhabited any other part of the premises, were told of this colony, but were assured they were of the same species as those we had already taken. Knowing from former experience, as stated before under *Chilonatalus tumidifrons*, that every colony may turn out to be an uncollected species, we decided to take a look at them to make sure, and our surmise was correct. Both males and pregnant females were taken in the same cave as *Macrotus waterhousii*, about four miles south of Georgetown, Eleuthera. Each female contained a single young, nearly ready for exclusion. A number were taken in the Hamilton cave, already referred to, on Long Island. They were farther back from the entrance than *Nyctinomus bahamensis*."

SANITARY CONDITIONS IN THE BAHAMA ISLANDS

SANITARY CONDITIONS IN THE BAHAMA ISLANDS

BY

CLEMENT A. PENROSE, M. D.

INTRODUCTION.

A thorough consideration of any country from a medical point of view would fill volumes. In these chapters, devoted to the medical conditions in the Bahama Islands, we can only hope to discuss in a general way the many interesting problems encountered on the Expedition, and leave until later, and to other means of publication, a technical study of the more important diseases.

The Bahama Islands offer so many rare opportunities for medical research that it was chiefly for this reason the author was persuaded to interrupt the even tenor of a general practice and take a trip of several thousand miles in a two-masted schooner of one hundred tons burden.

Situated as these beautiful little Islands are, well out in the Atlantic Ocean, often widely separated from each other, and even more isolated by the character of their shoals, which the wary mariner is only too anxious to avoid, they represent little units in which most interesting problems can be separately studied and which collectively constitute a study of the archipelago. As different islands are frequently inhabited by descendants of different races of people, such as Spanish, English, Americans, and Negroes, the old aboriginal stock having been completely exterminated years ago, one can study racial peculiarities under similar tropical conditions, and under varying conditions of civilization. In certain of the islands are found only white people who have entirely excluded the negro; in others, only negroes who have almost entirely excluded the whites; and between these two extremes are islands in which every mixture of white and black blood can be noted. This affords a rare opportunity for studying from a racial point of view the immunity of the blacks, whites and mulattoes to the prevalent conditions, and of contrasting the one with the other.

The inhabitants of the various islands also exhibit different degrees of civilization, depending on their accessibility to the rest of the world. For instance, we can contrast the refinement and culture found at New Providence, where Nassau, the capital city, is located, with the almost barbarism in some parts of Andros, one of the largest islands of the group, inhabited chiefly by blacks, and practically unexplored.

In some of the white colonies where black blood has been excluded, and where, owing to their isolated positions, frequent intermarriage has taken place, as for instance at Spanish Wells, and Hopetown, much degeneracy is present, manifested by many abnormalities of mind and body. Another very important study is that of leprosy, which is becoming prevalent among these Islands. As yet no means of excluding such conditions or isolating them from the rest of the inhabitants have been adopted, except at Nassau where there is a lazaretto, but which is used only at the volition of the patient. In view of the commercial and geographical relations of these Islands, it is important that this disease should be thoroughly studied and segregated. Finally a number of interesting tropical conditions, such as diseases of the special senses, particularly of the eye, are to be found in unlimited quantities and among a people crying out for treatment. In fact, owing to the rarity of a doctor's visit to the outer islands, often the most trifling conditions, as for instance a bad tooth or slight infection, may assume the most alarming proportions.

If the service which the medical staff was able to render hundreds of these poor, neglected people were the only work accomplished, we would have felt fully compensated for whatever hardships were endured. In fact, we were often compelled from the standpoint of humanity to neglect our own research work and attend to the needs of the suffering natives who at such times would accord us the greatest ovations, following us on the streets, kissing our hands, calling to us from the windows of their houses, and swarming in boat-loads around our vessel.

My assistants on the medical staff consisted of Messrs. E. B. Beasley, H. P. Cole, and T. H. Coffin, all students in the Johns Hopkins Medical School, and Mr. Frank Gillmore, who acted as medical photographer (Plate LXV, Fig. 1). Mr. Coffin, in addition to his duties as medical assistant, was detailed to study and collect the mosquitoes of the Islands. His report is given in another part of this volume.

In addition to the aid rendered by the various members of the medical staff, I take pleasure in acknowledging many special favors from Sir Gilbert

FIG. 1.—MEDICAL STAFF

FIG. 2.—VIEW OF GRANTS TOWN, NASSAU

VIEWS ILLUSTRATING SANITARY CONDITIONS

T. Carter, former Governor of the Bahamas; from Drs. L. O. Parsons and J. J. Culmer of Nassau, and Dr. J. J. Kellum of Governors Harbor; Rev. Charles B. Wilkenson of Clarence Harbor, Long Island, and especially Rev. C. R. Johnson and Captain Samuel Malone of Hopetown, Abaco, who rendered us great assistance in tracing the relationship of the inhabitants of that settlement. Surgeon-General Walter Wyman, of the Marine Hospital Service, kindly furnished me a report of the medical commission on leprosy, and Hynson, Westcott & Co., of Baltimore, rendered me efficient service with the medical equipment.

MEDICAL AND SURGICAL EQUIPMENT.

On a scientific expedition to a tropical country, there are no departments which require more careful consideration than the medical. In addition to the work proper there are so many things to be considered concerning the health of the men of the expedition, sanitation of the ship, etc., that more than ordinary care must be taken in the medical outfit.

We feel some pride in the knowledge that in this Expedition one of the most complete medical and surgical traveling equipments that we have ever seen was provided. Not a single man was brought back who was not benefited by the trip, which, of course, necessitated considerable exposure to the winds and weather, the direct rays of the sun, change in diet, and other hardships.

The equipment of the army, state militia, and Marine Hospital Service, which was carefully studied and gone over by us, we do not consider as complete for all-round scientific work as our outfit.

It contained all the drugs and instruments usually taken on such an expedition and in addition many unusual remedies and appliances for eye and ear work, nose and throat treatment, skin diseases, etc. A very complete bacteriological equipment was also included, consisting of all the latest stains for bacteria, and over two thousand tubes of different media, including fifty fermentation tubes for differentiating between the various dysenteries, typhoid fever, and other diseases. There were also provided a number of Erlenmyer flasks of bouillon for blood culture work, and the anti-toxins of diphtheria, lockjaw, pneumonia, erysipelas, etc., with a quantity of vaccine virus. Living cultures of typhoid fever, Malta fever, the Shiga bacillus from Japan, the Flexner bacillus from the Philippines, and other dysenteries for comparison and blood tests, were also included. A large quantity of malted milk was presented by Horlick's Food Company, of Racine, Wisconsin, and Eskey's Al-

buminised Food by Smith, French and Kline, of Philadelphia. Parke, Davis and Co., in addition to furnishing anti-toxins, presented the medical staff with several ounces of acetazone, the new remedy used with such success recently in the various enteric troubles. Last but not least, we took a very complete library of medical books and journals, and a thousand or more printed cards for taking histories and keeping a record of the bacteriological and urinary examinations made on the trip.

As the intention was to conduct free clinics on shore, this mass of material was so arranged that it could all be represented for the most part in two large chests designed for the occasion and which could easily be removed from the ship. These chests which were called separately the medical and surgical chests, were made especially for the Expedition, of hard-wood fiber, carefully braced and hinged with steel. The trays and drawers of these chests were so numbered, that as soon as one or more parts were empty they could be filled from stock boxes having a corresponding number, and hence avoiding useless delay in searching for the case wanted.

Two microscopes, both equipped with oil immersion lenses, were taken with us. A formaline apparatus, large enough to disinfect our ship or any houses, should this be necessary, was included in the outfit. We had especially prepared a medical commode in the form of a box, which could be readily carried on shore and which also contained an agate-ware douche-pan, bed-pan and urinal. A small chest in which the histories of patients could be carefully indexed and another containing all the bacteriological stains and appliances pertaining to the bacteriological work were kept in the laboratory on shipboard. In addition, there were some 10 or 12 boxes of stock material from which our supplies could be replenished as they became exhausted from the portable chests, and an extra surgical trunk for carrying basins, lanterns, hatchets, hammers, saws, etc., for making additional splints and appliances should it be necessary.

METHODS OF WORK.

Before starting on the Expedition the vessel which had been chartered in Baltimore, was carefully disinfected by a formaline apparatus and scrubbed down with castile soap and water, and a strong solution of bichloride of mercury. This was done not only for the protection of the members of the Expedition, but also to render our bacteriological work less difficult, as the chances of contamination of our media was much lessened under such cleanly conditions. On the way out to the Bahamas a complete examination of each

member of the Expedition, including the crew, was made and recorded, in order that if any of the party showed physical weakness or poor health, proper precautions could be immediately taken.

In order to facilitate our work among the natives we adopted the following method. As soon as we came to anchor at a settlement, the medical outfit was carried on shore, and a temporary free dispensary was quickly established in a convenient building (Plate LXVI, Fig. 2). At Spanish Wells the use of an unoccupied house was accorded us, while at Gregory Town the authorities dismissed the school and turned the building over to us. While a portion of the medical staff was engaged in making preparations for a clinic, several men were sent throughout the village spreading the tidings that the doctor had arrived and was prepared to give free consultations and dispense medicines without charge. It was our universal experience that for the first hour of our visit, there was little response, but after a few of the more courageous people had presented themselves for treatment, the more timid would come to us in crowds, complaining of all sorts of troubles, and begging to be relieved. The longer we worked in a settlement the more the natives seemed to throng about, until finally, when the time came to leave and go aboard the ship, we were often obliged to pack up our outfit with great difficulty, force our way through the crowd, and literally tear ourselves from the settlement. Even then the more determined individuals would jump into boats, follow us out to our vessel (Plate LXXIII, Fig. 1), force their way on board, and beg to be treated. In other places where a clinic on shore was not practicable, we would hold one on board the ship, where the cabin and a large portion of the deck was roped off to receive patients. It was, of course, impossible to treat all who applied, and the more desperate and interesting cases were selected, although a large amount of attention was given to patients suffering with ordinary diseases. Under such conditions it would have been impossible to accomplish anything without system. One of the assistants therefore selected from the crowd the most interesting or desirable cases; another would note, on cards prepared for the purpose, the family and personal history of the patient as well as the history of the present illness. A third assistant took samples of the blood and prepared slides for microscopic examination, while others were at hand to do any special work necessary. Mr. Gillmore was present to take photographs of some of the more interesting cases, in order to preserve records which could not otherwise be obtained. As fast as the cases were prepared, I would examine them and either operate or prescribe the treatment which seemed necessary.

IMPORTANT DISEASES ENCOUNTERED.

By far the greater proportion of diseases treated in the various dispensaries were of the commoner sort. We, however, were on the alert to select for special study the more important cases which every now and then presented themselves; and it is to these cases that I wish to call particular attention, although I shall have something to say regarding the less important diseases.

TUBERCULOSIS.

A disease which of course must always receive most careful consideration in any country is that of tuberculosis, the great white plague, which has existed for so many years in every latitude. As the Bahamas have often been recommended as a health resort, especially for pulmonary conditions, this is an important question. Personally, I consider the climate of the Bahamas a favorable one for tubercular conditions, especially that type of pulmonary tuberculosis (*phthisis florida*, or galloping consumption), where there is a rapid softening and breaking down of the lung tissues. In such cases living in high altitudes is apt to be dangerous. Of the many patients visited, examined, and treated at the various clinics on shore and on the vessel's deck, I do not remember seeing a single case of "galloping consumption," but the several cases which came to our notice, all belonging to the fibroid or chronic type (*phthisis fibrosa*), in which there was generally a history of some years duration, and physical examination showed pleural thickenings and fibroid conditions. Hemorrhage seemed to be much less common in these cases than in tuberculosis patients of the United States.

We did not encounter many cases of tuberculosis in other parts of the body. A case of hip disease in a little girl at Tarpum Bay, Eleuthera, and one or two patients with scrofulous glands and scars of old abscesses, were the only exceptions. We did not meet with a single instance of lupus or tuberculosis of the skin. The ordinary bronchial and catarrhal troubles, such as asthma and corizas which are of such frequent occurrence in the United States, are extremely rare in the Bahamas. In fact the members of the Expedition were much surprised at the amount of exposure they could undergo without contracting the slightest cold. Although my companions were frequently wet to the skin and at times, especially during rough weather at sea, were obliged to sleep in damp clothing, there was but one case of sore throat developed, and this was exceedingly slight and of short duration. We were all surprised at the amount that one could use the voice, either in singing or shouting, without the slightest fatigue of the vocal organs.

I can, without hesitation, assert that the climate of the Bahama Islands is well adapted for selected cases of pulmonary troubles, and if the natives who suffer from pulmonary tuberculosis could be placed in a suitable hygienic environment and be supplied with proper food, their chances of recovery would be excellent.

Venereal Diseases.

Syphilis.—We did not see many cases of syphilis, although the physicians at the various islands which we visited told us that they met with about the usual number, which was generally brought to the natives by sailors from foreign vessels. The few cases I saw showed tertiary manifestations, and did not appear to be, considering their poor treatment, especially virulent. It is probable that the amount of syphilis is very much overestimated, as many cases, thought by the natives to be such, proved on examination to be simple varicose ulcerations or chronic eczemas, etc. In view of the fact of the large amount of degeneracy and locomotor-ataxia found among these Islands, it is rather interesting to note the small proportion of syphilitic cases. In most instances where the conditions of degeneracy, locomotor-ataxia, and other defects of the nervous system, were studied, we were able to get a history covering several generations, and were surprised to find but little syphilis. This question will, however, be taken up again later under the chapter on degeneracy.

Gonorrhea.—We were informed that there was about the usual amount of gonorrhea that one might expect to find. I met with a few cases of bladder and prostatic affections which were probably due to this source. On some of the islands this disease can easily be spread, as the relation of the sexes is most promiscuous and probably a large proportion of the children born are illegitimate. We met with a fair number of cases of gonorrheal ophthalmia, which in one or two instances were most pitiful, as they had received practically no treatment.

Malaria.

We were unfortunate in the time of the year for the study of this disease, the cases usually not appearing, so I was told, until the end of July, from which time on until the winter months they are quite prevalent. Although we obtained a number of histories of former chills and fever, probably dating only a few months back, surprisingly little malaria was encountered.

We did not feel justified in puncturing the spleens of any of these natives, as our visits were usually so short that we could not follow the effects of such procedure.

After frequent microscopic examinations, I finally discovered at Clarence Harbor, Long Island, in the blood of three natives undoubted crescent and ovoid forms of the æstivo-autumnal malarial parasite.

The malarial parasite in all instances showed the finely granular pigment closely collected at the center of the crescent, and corresponded to the type of subtertian variety figured by Dr. Patrick Manson[1] in his work on tropical diseases.

The fever in these cases was of the irregular remittent type. The patients were prostrated, showed large spleens, had more or less pigmentation of the skin, and, in the more severe cases, a fever of 104 degrees and over. The patients from whom we removed the parasites were in a fair condition of nourishment. I believe that malaria is fairly prevalent in these Islands at the height of the autumn months and a number of the natives show evidences of malarial cachexia although having no parasites in the circulating blood. Strange to say, the *Anopheles* mosquito was singularly absent, as is shown in another part of this volume.

Rheumatism and Lumbago.

Chronic rheumatism and lumbago, owing to the exposure to which the natives are subjected, is quite prevalent. Almost all the older people complain of misery in their back and legs. We did not, however, meet with a single case of acute inflammatory rheumatism among all the patients treated and I do not believe that this is a very common disease among these Islands. Neuralgias and myalgias, however, are quite common.

Gastric and Intestinal Troubles.

Owing to the poor quality of food on which the people of the Bahamas subsist, it is not surprising to find a considerable amount of stomach and intestinal troubles. This, however, does not seem to be of a very severe type, and is associated more with feelings of discomfort in the abdominal region, than with any especial pain. We found in a few settlements some acute diarrhea, which was usually due to an over-indulgence in tropical fruits, and did not present any typhoidal or infectious characteristics. On one of the islands we found a small boy with acute dysentery. This, however, was of short duration, and owing to the fact that we had only time to remain on the

[1] Tropical Diseases, p. 73.

islands a few hours, it was impossible to make any bacteriological examinations. In my opinion, if the nature of the food products could be improved, the Bahamas would be quite free from intestinal troubles. Not a single member of our own Expedition contracted dysentery and no case of diarrhea lasted over a day, although many of my companions were imprudent in their diet and exposure to the sun.

We made a number of chemical and bacteriological examinations of the well and cistern water at Nassau, and found that in some instances they showed contamination from sewerage.

Diseases of the Eye.

One cannot travel among the Bahamas without being struck with the numerous diseases of the eye met with everywhere throughout the Islands. Owing to the intense actinic properties of the sun's rays in these regions and the extreme degree of reflection of light from the surface of the blue waters and white coral sands, it is not surprising that such is the case. Without exception, almost all the adults whose occupations required them to expose themselves on the sea and seashore showed *conjunctiritis, pingueculæ, pterygium-growths, iritis,* etc.

One is impressed with the great number of cataracts which usually appear to accompany middle or old age. It was pitiful to see neglected so many cases of ripe cataract which could easily have been operated on with every possibility of restoring sight.

At Hopetown, Abaco, we found a number of cases of congenital blindness due to atrophy of the optic nerve. In one family alone there were three brothers, nearly of the same age, who had been blind from birth (Plate LXXIII, Fig. 2). One of these boys later came to Baltimore to ascertain if anything could be done for his condition. After a careful examination by both Dr. James J. Mills, a specialist in the Eye Department of the Johns Hopkins Hospital, and myself, we found that the condition of the eyes was one of *pigmentary retinitis* and *chorydítis*. associated with optic nerve atrophy, which is a rare condition and is stated by the authorities to result chiefly from consanguineous marriages.

This patient was only one of a large number of individuals residing at Hopetown who have suffered from the effects of too close intermarrying. A description of this interesting community is given below. In conclusion I may say that the Bahamas offered a rich field for the investigator of eye diseases,

and any oculist who cares to spend a few weeks among these unfortunate people would find his labors amply rewarded.

FILARIASIS.

While at Nassau, Mr. Beasley and I made several visits to the hospital at midnight for the purpose of examining the blood of patients for *Filaria.* We were fortunate enough to discover one of these embryonic parasites in a man who had recently been received from Long Island, Bahamas (Plate LXXVII). This parasite, which is a minute, transparent little worm and is usually found wriggling about in a state of great activity, was in this instance motionless, and we were inclined to believe that it belonged to the species *Filaria diurna*, which is active only in the daytime, whereas the species *Filaria nocturna* is generally only active at night, and found in the peripheral circulation at this time. Some credence was given to this belief by the fact that the specimen which was motionless at night, later, on the following day became active and was seen to be struggling in the field of the microscope, lashing the red blood corpuscles about in a furious manner. However, subsequent examinations from the blood of the same patient showed active parasites at night, and we were inclined to think the species was that of *Filaria nocturna*, and that the man by sleeping during the day favored its appearance in the circulation at that time. On measurement, these embryos were found to be about $\frac{1}{50}$ of an inch in length by $\frac{1}{3000}$ of an inch in diameter, or about the diameter of a red blood corpuscle. We discovered only one other case of *filariasis* during our cruise in the Bahamas and that was at Hopetown, Abaco. The patient was a little boy. Only one specimen of his blood was obtained, after which the youngster, who was evidently frightened, disappeared and could not again be found. We only discovered one case of *elephantiasis*. This was in an old colored woman at Current Settlement, Eleuthera, who had an involvement of the leg of moderate grade only, but gave a history of similar conditions in her family. This case will be discussed later.

We obtained numerous specimens of this filarial parasite. Of all the stains used the most successful was the soda eosin methylene blue stain, prepared according to the formula of Dr. Wright of Boston. Under the low power it appeared to be without structure, and seemed to be enclosed in a delicate sheath in which it moved backward and forward. This sack or sheath was longer than the worm it encloses. About the posterior part of the middle third there was an aggregation of granular material: this ran for some distance in the

FIG. 1.—SHORE CLINIC AT CURRENT SETTLEMENT, ELEUTHERA

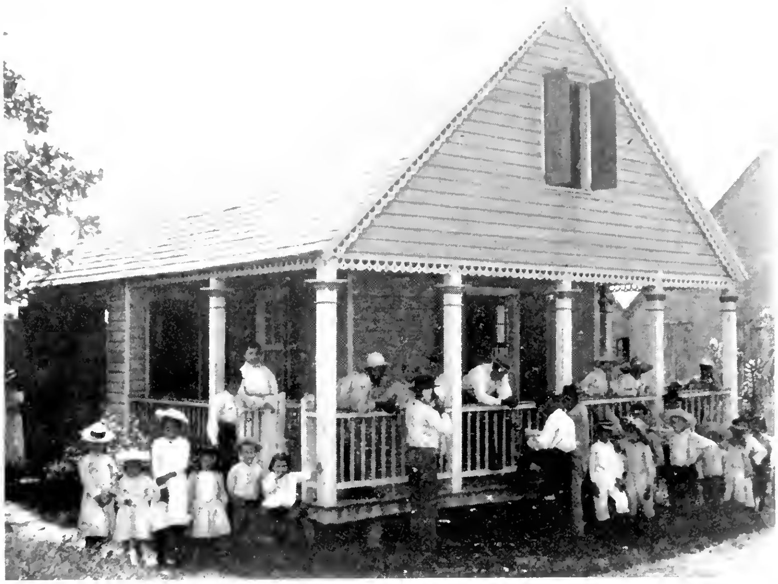


FIG. 2.—TEMPORARY DISPENSARY AT CURRENT SETTLEMENT, ELEUTHERA

VIEWS ILLUSTRATING SANITARY CONDITIONS

axis of the worm. Under high power a very delicate transverse striation could be detected throughout the entire length of the animal. The body seemed to be composed chiefly of closely packed minute cells, enclosed in a transverse, striated, musculo-cutaneous cylinder.

By careful focusing it was found that the head end contained a six-lobed prepuce, and while the parasite was alive a very thin fang could be detected, which stood out from the extreme end, when this prepuce was inflated. The *Filariæ* belong to the class of worms called *Nematodes*, and are three or four inches in length. The sexes live together, and frequently are very closely packed about one another. The female *Filaria* is the larger, both in length and thickness. The two uterine tubes occupy the longer diameter of her body and are filled with ova at various stages of development. In both sexes the mouth end is slightly tapered. The vagina opens not very far from the mouth and the anus just in advance of the tip of its tail. The male worm is characterized by being much more slender, by its marked tendency to curl and its peculiar, sharply incurved tail.

Ordinarily these worms lie in the lymphatic vessels of the body, and are productive of no especial symptoms with the exception, in the common variety, of the embryonic *Filariæ* appearing in the peripheral circulation at night. Under certain conditions, however, *elephantiasis arabum* has been produced by the plugging up of the lymphatic circulation. In cases of *elephantiasis* the embryo *Filariæ* are never found in the blood. The reason for this, appears to be that the embryo of the *Filariæ*, which are supple, slim, and actively moving organisms, can readily pass through the small lymphatics and vessels, but in case of injury to the adult female worm, in place of giving birth to these embryos, aborts and lays the eggs, which are usually attached inside of her body, and being oval bodies nearly five times the diameter of the embryo, they are quite incapable of traversing the small lymphatics, and hence plug them up. This stoppage not only prevents any embryos which may subsequently be born from reaching the peripheral circulation, but also causes the affected part to swell. This theory is substantiated by the cases of elephantiasis which develop in countries where the *Filaria* is so commonly found in the blood after injury.

Recently and chiefly through the work of Dr. Patrick Manson,[2] mosquitoes, especially the species *Culex fatigans* and *Anopheles nigerrimus*, have been shown to be an important intermediary host of the *Filaria nocturna*. If fed on

[2] Tropical Diseases, pp. 555-556.

the blood of a person who has *Filariæ* in his circulation, the blood examined in the stomach of the mosquito will show living *Filariæ*. After a time as the blood becomes concentrated in the stomach of the insect the embryo *Filariæ* wriggle out of the sheaths in which they were contained, and become much more active, moving from place to place. Later on, these sheathless parasites disappear from the blood in the stomach of the mosquito and are found in the thoracic muscles of the insect. Here they undergo a metamorphosis in about 16 to 20 days, in which time they develop a mouth, a peculiar three-lobed tail, and increase to about one-sixteenth of an inch in length.

They now leave the thorax by the pro-thorax, and entering the head of the mosquito, coil themselves up close to the base of the proboscis. Dr. Bancroft of Australia has shown that the *Filariæ* find their way into the proboscis and it is in this way, probably, that it eventually comes into the lymphatics of the human being.

The parasite may remain in the interior of the labium of the mosquito according to Manson for sometime, awaiting an opportunity to enter the host, but the exact nature of the process by which the *Filariæ* emerge from the proboscis of a mosquito, has not been determined. Introduced into the human body it finds its way into the lymphatics and there attains its sexual maturity.

Elephantiasis.

We found but one case of this interesting affection in the Bahamas, and this was at Current Settlement, Eleuthera. The case was that of an old colored woman beyond middle age with a well-marked but not excessive enlargement of the left leg, especially from the knee down. This enlargement was uniform and the skin of the leg was not especially indurated or thickened, but she gave a history of attacks of inflammation of the skin of the leg at different times in her life, accompanied by considerable pain and burning sensation. From her history it was evident that this condition had been present in some of the other members of her immediate family. The case was a mild one.

Whether this disease was due to *filariasis* or not, it would be difficult to determine, not finding any such conditions in this settlement, but we presume that it was of this nature.

With this exception, no other cases of *elephantiasis* were noted among these Islands, although, in past years, several cases have been admitted to the hospital at Nassau.

Leprosy.

One of the most important diseases which we studied in the Bahamas and which was especially interesting to us on account of its rarity in this country was that of leprosy. This disease is rapidly becoming, and in fact already is, quite prevalent among the Bahama Islands. With the exception of a lazaretto at Nassau, the government has provided no means of isolating or caring for the people suffering with this horrible affliction, and it is for the purpose of bringing this matter to the attention of the authorities that much of the discussion in this chapter has been undertaken.

Forms of Leprosy.

There are two chief forms of leprosy, one called the tubercular form, *lepra tuberosa* or *tuberculosa*, and the other the anesthetic or maculo-anesthetic.

Tubercular Leprosy.—This is characterized by the growth of granulation tissue in a nodular manner or as profuse infiltration of the skin, of mucous membrane with resulting disfigurement. The disease usually starts with the appearance of erythematous patches attended by some fever and followed by small nodular thickenings in the skin especially of the face, backs of the hands and feet, and extensor aspects of the arms and legs. These nodules enlarge and produce great distortion of the surface so that an appearance is given to the face which is described as the *leonine facies* (Plate LXX). This thickening is chiefly in the cutis of the skin, and the epithelium becomes stretched over the nodules to such an extent that an oozing surface is developed or actual ulceration takes place. The eyes, mucous membranes, mouth, larynx and pharynx are the seats of similar nodular growths. The internal organs, especially the liver, spleen and testicles, may become affected secondarily. The changes in all situations are characterized by a chronic inflammatory condition, accompanied by abundant growths of granulation tissue, in which tissue a large proportion of the cells are rounded or oval in shape and may be of quite a large size showing vacuolation with vesicular type of nucleus. These cells are spoken of as "lepra cells." Periarteritis is a common change and very frequently the superficial nerves become involved in the nodules and atrophy. The tissue in the leprous lesions is vascular when young, and never shows caseation as in tuberculosis. Lepra cells may contain several nuclei but do not resemble the giant-cells in tuberculosis.

Anesthetic Leprosy.—The changes here are in the nerves with resulting

anesthesia, paralysis of the muscles and trophic disturbances. In the early stages the patient complains of pains along the nerves, and patches occur on the skin of considerable size, the margins of which show a congestion. Later these patches become pale in the center but the margins remain pigmented. After a time remarkable trophic changes appear in the skin, muscle and bones. The skin becomes atrophied like parchment and skin eruptions as *bullæ*, etc., as in *pemphigus*, often appear. Great distortion of the extremities may occur with necrosis and separation of parts. The lesions in the nerves are of a chronic inflammatory nature but with less granulation tissue than in the case of tubercular leprosy. This is probably due to the fact that fewer bacilli are found in the anesthetic type. (Plate LXXI.)

Bacillus of Leprosy.

The bacillus of leprosy was observed first in leprous tissues by Hanson in 1871, and further researches were made by Neisser in 1879. This bacillus has not with certainty been grown artificially, although recently Dr. L. Alvarez believes he has gotten slight growths on blood serum. The leprous bacilli are practically the same size as the tubercle bacilli and resemble them both in appearance and staining reactions. They take up the basic aniline stains rather more readily than the latter, but in order to stain them deeply a powerful stain such as carbol-fuchsin is necessary. They resist discolorization, but less so than the tubercle bacilli, as it requires but about 5 per cent sulphuric acid solution to remove the carbol-fuchsin. The best method of staining them is to use the Ziehl-Neelson carbol-fuchsin stain, and then Gabbet's methylene blue solution with only one-half the strength of sulphuric acid in this solution as is used in staining the tubercle bacilli. Dr. Alvarez never succeeded in finding decolorized bacilli in old tubercles or ulcerations. They were found only in recent eruptions or nodules and are probably the young or active bacilli, while the bacilli which hold the stain are probably old and inert. He states that this discovery may serve to explain the many failures in producing evidences of culture on artificial media

Dr. Arning who conducted numerous experiments relative to the resisting power of the leper bacillus in tissues showed that it resisted the extreme conditions of temperature and moisture conducive to the development of putrefaction, even when put aside for a considerable length of time.[3]

[3] Report on Leprosy in the Hawaiian Islands, Nov. 29, 1898. Letter from the Surgeon-General of the Marine Hospital Service, etc. Senate Doc. No. 269, 57th Cong., 1st session, pp. 106-107. Reprinted from Public Health Reports, December 30, 1898.

Transmission of Leprosy.

Although the *bacillus lepræ* is generally accepted as the cause of leprosy, the conditions under which it develops and invades the human system are still unknown. Some have asserted that leprosy is inherited; others, that it is transmitted by contact; while there are not a few who hold that the disease, if not directly caused by a fish diet, is at least aggravated by too great a proportion of this food.

In regard to this last point, the observations of Dr. A. W. Hitt,[4] who has spent several years among the lepers of India, are of special interest. Dr. Hitt says that the Kabirpauthis of India, who abstain as a rule from the use of meat show the largest ratio of lepers per 10,000 of any religious sect in India, while the Jains, who always abstain from the use of animal food show next to the smallest ratio. His observation would seem to argue against the theory of a fish diet. But Dr. Hitt also concludes that nothing is gained by classifying these patients according to their religious caste which allows only a certain kind of diet, for the Christians and Mohammedans, who eat meat and live on a mixed diet, show a higher ratio of lepers, while the Sikhs, who also live on meat and a mixed diet show a lower ratio.

As a matter of his own observation, Dr. Hitt says fish alone will not affect a leper, neither will milk alone, but when given a mixed diet of fish and milk the ulcers enlarge and the patient grows worse. Why this is the case is unknown. He believes that the lack of food or some other cause that has a tendency to lower the vitality will act as an important factor in the causation of leprosy. In his paper he also gives an interesting table that shows an increase in the number of lepers proportionate to the amount of rainfall.

Although the theory that leprosy is transmitted by contact lacks final proof, there is a growing conviction that such is the case. Owing to the long period of incubation of this disease as well as to the fact that it appears to be confined to the human race, experiments become difficult and uncertain. For instance, Dr. Arning, while investigating leprosy for the Hawaiian Government, inoculated a man named Kenan, a condemned criminal, with leprous tissue on September 30, 1884. In 1887 the criminal had developed leprosy. The flaw in this experiment was that Kenan had a nephew who died of leprosy, which made it possible that the disease ran in the family.[5]

Any one who has examined a fragment of leprous tissue under the micro-

[4] *Loc. cit.*, p. 86.
[5] *Loc. cit.*, p. 105.

scope and has seen it teeming with myriads of bacteria, must admit it possible that leprosy is transmitted by contact. And this possibility becomes well nigh a certainty when it is considered that this tissue on ulcerating and sloughing liberates these bacteria in countless millions to attach themselves to whatever objects come within their reach. Vast quantities of bacilli are unquestionably eliminated from the skin and from the nasal and buccal mucous membrane of lepers. It is therefore very probable that every leper is a danger to his surroundings, the amount of danger varying with the nature and the extent of his relations therewith, and also with the sanitary conditions under which he lives.

Surgeon D. A. Carmichael in his report on leprosy in the Hawaiian Islands [6] speaks of kissing, nose rubbing, cohabitation, and reception of the secretion on abrasions of the surface of the skin or by inhalation, deglutition, or transmission by insects as possible methods of communication. Probably one of the most common sources of contagion is through improper vaccination and uncleanly shaving. The common house-fly, mosquito and bed-bug in all probability also transmit leprosy, for Dr. Alvarez, leprologist of the Hawaiian government, found leprous bacilli in the bodies of mosquitoes which had alighted on the open sores of lepers.[7]

Treatment of Leprosy.

In regard to the treatment of leprosy in India, Dr. Hitt [8] says that chaulmoogra and gurgan oils seem to be favorites, especially when the chaulmoogra oil is used as an inunction. Arsenic, in early stages, is sometimes of service. Iodide of potassium is also good in some cases. General and surgical cleanliness is, of course, absolutely essential, but if the ulcers are healed too quickly, unless an alterative is given, the temperature of the patient is likely to go up to 102 or 104 degrees and his general condition suffers. He prefers the iodide of calcium given in combination with bromide of calcium and syrup of sarsaparilla. He also gives ichthyol internally in tubercular cases beginning with 10 drops and increasing gradually until a drachm is taken at a dose. Bathing is considered very necessary and in some cases the water is slightly acidulated with sulphuric acid. Patients suffering from the anesthetic type should not bathe in the same baths with those suffering with the tubercular

[6] *Loc. cit.*, p. 95.
[7] *Loc. cit.*, p. 106.
[8] *Loc. cit.*, p. 89.

type. In some cases where the ulceration is very extensive, Dr. Hitt[9] recommends a dusting powder, nosophen (tetraiodophenolphtalein). Unna recommended applications of pyrogallol, chrysarobin, resorcin and ichthyol. It is also an important fact that serum therapy has so far been unsuccessful.

In view of the virtual incurability of leprosy and the detrimental effects which its existence in the community causes, and in consideration of the good results which have followed the adoption of legal measures of isolation in Norway, the International Leprosy Convention which met at Berlin in 1897, adopted the following resolutions.[10]

First.—"In such countries where leprosy forms foci or has a great extension we have the best means of preventing the spread of the disease."

Second.—"The system of obligatory notification, observation and isolation as carried out in Norway, is recommended to all nations with self-government and a sufficient number of physicians."

Third.—"It should be left for the legal authorities after consultation with the medical authorities to take such measures as are applicable to the special social conditions of the districts."

The above report of the Secretaries of the International Leprosy Conference unquestionably shows that in the opinion of the highest medical authorities of the world leprosy is a contagious disease.

Status of the Leper in the Bahamas.

There is no question that leprosy is prevalent among the Bahama Islands. I personally examined and studied a number of cases and heard of a still greater number which lack of time and opportunity would not permit me to investigate. The condition of many of these unfortunate people is wretched in the extreme, and is in itself a matter which should demand prompt attention on the part of the authorities. But what shall be said of the other aspects of the question when I state that public opinion is so lax that not only is little done to ameliorate the condition of the lepers, but they are actually allowed to run at large through the communities in which they live and associate freely with their fellows?

We were much surprised at the indifference displayed toward this disease, especially among the ignorant natives, for we often found a leper living in the same house with apparently healthy individuals, without the least concern being expressed or shown by the other members of the household.

[9] *Loc. cit.*
[10] *Loc. cit.*, p. 43.

At Nassau, on the same grounds as the other hospital buildings, there is a small building set aside as a lazaretto where lepers are confined at their own volition (Plate LXVIII, Fig. 1). Aside from this one asylum, there is absolutely no provision for the care of people afflicted with this loathsome and disgusting disease. Moreover, the arrangements in this lazaretto are out of date and thoroughly inadequate. Owing to the fact that in the Bahamas the water supply is derived from wells and cisterns, the opportunity for cleanliness among such patients is not of the best, and I did not see that it was possible to be otherwise under the present arrangements.

Recommendations Regarding Leprosy.

In view of what has been said above, I deem it my duty to urge the people of the Bahama Islands to arouse themselves and grapple with this disease without delay, and as an aid to this end I submit the following recommendations:

First.—As there is no known cure for leprosy, the victims of this disease should be diligently sought out and isolated from their fellows.

Second.—Two islands should be set aside, one for the detention of suspected cases of leprosy, and the other for the permanent isolation of patients in which the disease has made itself fully manifest.

Third.—These islands should be thoroughly and amply equipped with the most modern facilities for coping with the disease and for contributing to the comfort of the unfortunate victims.

Fourth.—In the asylum set apart for the pronounced cases of leprosy, the two types could be detained in different enclosures and studied and treated separately.

The climate of the Bahamas is well suited to the establishment of such asylums, and they could be maintained for less expense than similar ones in other regions.

I cannot help feeling that unless some measures are taken in the near future to meet this deplorable condition that the commercial relations between the United States and the Bahama Islands may be seriously impaired, especially when the authorities in this country are aware of the actual conditions in the Bahamas.

One often has to see the worst in order to act for the best, and I feel sure that a thorough investigation of the matter by the authorities of the Bahamas would be productive of radical measures to stamp out leprosy from these Islands.

FIG. 1.—VIEW OF INFIRMARY, NASSAU

FIG. 2.—VIEW OF HOSPITAL, NASSAU

VIEWS ILLUSTRATING SANITARY CONDITIONS

Yellow Fever.

We did not meet with a single case of yellow fever during our cruise among the Bahama Islands. In fact, no cases of yellow fever have been reported in the Islands for the last forty years. Mr. Coffin, however, in his investigation of the mosquitoes found that the yellow fever mosquito, *Stegomyia fasciata*, was present in most localities where the Expedition stopped. The absence of yellow fever, therefore, is not due to the lack of favorable conditions for spreading the epidemic, but to the watchfulness of the authorities and the well organized quarantine service. The only protection against this dread disease to the various communities living in the Bahama Islands is a prompt and complete isolation of any cases of yellow fever which may in the future chance to appear in their midst.

Polydactylism.

Although we only observed one instance of this interesting condition, we learned that it was quite common in the Bahamas. The case we saw and studied was that of a full-blooded negro, Samson Rooker (Plate LXXII, Fig. 1) by name, who lived on the island of Andros. The interesting feature in his case was the perfect symmetry of the right hand and foot, although the hand possessed an extra little finger (Plate LXXIX, Fig. 2), and the foot an extra little toe (Plate LXXVIII, Fig. 2). Indeed, so perfect was the formation of the hand, that one would scarcely notice any abnormality unless the fingers were actually counted. The left hand and foot showed only a rather rudimentary little finger (Plate LXXIX, Fig. 1) and little toe. At one of the other islands we were informed that there was a man who had seven fingers on one hand and a former resident of Hopetown, Abaco, the so-called "three thumbed Jack," was celebrated from the fact that he had three thumbs on each hand.

Polydactylism, which is congenital in many cases, seems to be hereditary. Most frequently the extra toes or fingers are placed symmetrically on both hands and feet. Usually there is but a single digit on the side of the little finger or toe, though more rarely the thumb, and much less often the great toe is doubled. The development may be complete even to an extra metacarpal or metatarsal bone, or it may be more or less imperfect, and is often little more than a rudimentary nodule connected with the side of the phalanx. When perfect, it is most often attached at a greater or less angle to the end of the metacarpal or metatarsal bone of the normal finger or toe. At times the connection with the hand or foot is by fibrous bone of varying length and

firmness. Occasionally the extra digit is so closely joined, that it is contained in the same common envelope of skin. It can be amputated at any time, but it is best to remove it shortly after birth. If the hand or foot are completely formed, as in the case of the right hand and foot in the illustration, an operation is unnecessary.

Ainhum or Ring-toe.

This disease usually appears first as a small groove on the inner and plantar surface of the base of the little toe and gradually deepens and extends around the whole circumference until the toe is separated from the rest of the foot. In the meantime the distal portion of the toe is apt to swell up to considerable size. (Plate LXXVIII, Fig. 1.) This may occur on one foot or on both feet simultaneously. The fifth or little toe is most frequently affected, next in order the fourth, very rarely the third, second or great toes. But cases have been reported where all the toes have been involved and the disease has extended to the leg. Usually this condition is without especial pain, though in one or two cases a considerable amount of shooting pain was complained of, extending up to the foot: especially when the toe was bruised or struck against anything.

We found the natives very anxious to part with the members thus diseased, and, in fact, occasionally brought about a more rapid amputation by the use of string. Almost invariably, under ordinary precautions, the stump heals up without any bad results. The general condition of health does not seem to be a determining factor in this peculiar disease.

Ainhum is most common in males and rare in women and children. We saw a number of cases of this interesting disease while in the Bahamas, and found it chiefly confined to pure blacks, although, occasionally, occurring in mulattoes.

Nothing is known concerning the etiology of this disease. By some it is considered a trophic nervous affection, or a form of sclerodermia, while others recently have suggested a relationship with anesthetic leprosy. Possibly irritation and wounds from going barefoot may be a factor. An interesting case of ring-toe in a colored boy of seven who had also developed tubercular leprosy on his left cheek was brought to our attention. (Plate LXX, Fig. 2.)

We amputated a number of ring-toes and brought them back with us for study, with a view of staining, especially for lepra bacilli. Sections of these toes showed considerable development of the fatty parts, especially of the sub-

cutaneous fat, with fatty degeneration of the bone and other tissues. The bone is usually considerably absorbed. At the seat of constriction the epithelial layers are greatly hypertrophied with atrophy of the papillary layer of the skin. Below this is a band of fibrous tissue very thick and dense. The most careful staining by several methods failed to show a single lepra bacillus.

We were struck with the tendency of this disease to run for several generations in the same family. From the fact that a number of persons so affected complained of rheumatic and sciatic pains, as well as from the tendency of this disease to run in certain families, it would seem that some trophic condition of the nervous system was the most likely explanation of its origin.

The best treatment of this disease is, in the early stages, to make transverse sections or cuts along the line of constriction, and later, if this first method fails, to remove the affected toe.

Talipes or Club-foot.

We were considerably interested in the numbers of cases of this condition we saw and heard about during our medical studies in the Bahamas. They were generally of the congenital variety or *talipes equino-varus*, and usually affected both feet. As to the cause of this condition, there has been much speculation. It has been attributed to uterine pressure, to intra-uterine disease of the cerebro-spinal axis with resulting paralysis and arrest of development. It is not seldom associated with other malformations of the head, face, spine, abdominal wall or pelvis. We were interested to note the influence of heredity in this condition as demonstrated in a family at Hopetown, Abaco, where the condition ran for two generations in the family of Capt. Samuel Malone. It appears that both of his grandchildren by one son were born with congenital club-feet. The births in both cases were normal, and the father and mother physically and mentally were rather above the standard of the community. We did not see instances of the other forms of this condition, as for instance *talipes equinus, talipes calcaneus,* or *talipes varus*. but all the types we met with were of the congenital or *equino-varus*.

Locomotor-Ataxia.

We were especially impressed with the number of cases of locomotor-ataxia found among the people of the Bahamas. This interesting disease which is comparatively rare in the United States is unusually prevalent among these Islands. At the hospital at Nassau, during 1902 and 1903, twenty-two cases

were treated, eleven each year; and in the female ward of the same institution we saw a case in a girl only nineteen years old, which is a very early age for this disease. At Spanish Wells, out of 150 people examined, we found eight cases of locomotor-ataxia, and a thorough examination of the entire population would have doubtless revealed more. At a number of other islands we found additional cases of this disease, always present in proportions abnormally large when compared to other afflictions.

These cases showed typical symptoms of the preataxic, ataxic, and paralytic stages of the disease. The symptoms complained of were usually lightning pains, ocular aberrations, as for instance Argyll-Robertson pupil, in which there is a reaction to light but not to accommodation, optic atrophy, the loss of the knee-jerks, characteristic ataxic walk, paralysis, etc.

In view of the small proportion of syphilitic cases in the communities where locomotor-ataxia is prevalent, it would seem that some other factor than syphilis must be considered the cause of this disease. From my studies in the Bahamas, I am inclined to think that poor conditions of life, bad sanitation and hygiene, exposure to the wind, weather, and salt water, together with consanguineous marriages, must be regarded as important etiological factors. When it is remembered that many of the people who are now suffering with locomotor-ataxia have formerly been fishermen, boatmen and sailors, who have engaged in diving for sponges and have remained in the water for hours at a time, the possible reaction of this condition of life on the nervous system should not be neglected.

Pesplanus or Flat-foot.

Flat-foot, owing to the habit of long standing with bare feet in the water, and general poor nutrition of the people, was so common as to be almost a normal condition among the poorer classes in the Bahamas. An extreme degree of this condition is in the Bahamas endured with little or no complaint, which in a more civilized community would be productive of considerable pain and loss of function.

Boils, Carbuncles and Infections.

Infections occasioned by neglect, occasionally assumed alarming proportions among the natives. There is a variety of infection following puncture, usually of the hands, by the sharp end of the leaf of the sisal plant, which is said to become chronic and exceedingly difficult to heal. There seems to be some

possibility that a poisonous condition is produced in the wound by the juices of the plant, but whether this is so or not I am not prepared to say.

In a number of instances we also noticed some chronic sores of the hand, which followed the picking or handling of pineapples.

Abscess of various parts of the body, especially of the jaws from defective teeth, were found very prevalent. In fact, the condition of the mouths of most of the natives past middle age was generally very bad, the teeth seeming to decay and disintegrate very rapidly. This is probably due in a great measure to the poor food, with resulting indigestion, and also to poor conditions of living.

Taking into consideration the rough nature of the coral rock, over which these people so frequently walk and transport their belongings, accidents and injuries of various kinds seem to be very few and far between.

Degeneracy.

One of the most interesting problems which the medical staff was called upon to investigate was that of degeneracy. Individuals who had evidently reverted to conditions both physically and mentally lower than that of their immediate ancestors, were frequently met with throughout the Bahamas; but there were two settlements where these conditions seemed particularly well marked. One of these was Spanish Wells, George Island, and the other Hopetown, Abaco. We visited both of these places, and to the latter gave special study.

History of Spanish Wells.

Spanish Wells was supposed to have been settled by pirates, who refused to mingle with the surrounding negroes, and as the number of white people in the settlement was limited, close intermarrying resulted. The consequences of this practice are evident in the present condition of the inhabitants. Here we found an abnormally large proportion of locomotor-ataxia, and eye diseases, including cataracts, pingueculæ and pterygium-growths. We examined one dwarf woman 69 years of age (Plate LXXII, Fig. 1), and were told that there had been several other dwarfs in the settlement, some of whom had died recently. We noticed, also, that the mental acumen of many of the inhabitants of this place was rather low. The condition of these people, although bad enough was very much better than that of the inhabitants of Hopetown.

History of Hopetown.

At Hopetown the evidences of degeneracy were more abundant and marked and consequently to this place more attention was given. Hopetown is a settlement of about 1000 pure whites and 12 colored people. As the two races have not intermingled appreciably, our study was rendered much more simple on account of the absence of mulattoes. In brief, the history of the colony is as follows:

Wyannie Malone, a widow and a Tory sympathizer, not wishing to remain in the United States after the close of the Revolutionary War, changed her residence from Charleston, South Carolina, to Hopetown, Abaco, in 1785. She brought with her four children, Ephraim, David, Sarah, and Wyannie. Walter Malone, one of the children, died in South Carolina. Sarah ran away with the captain of a whaler and was lost track of. The other three children married and settled down at Hopetown. Ephraim married Elizabeth Tedder of Harbor Island. David also married a woman from Harbor Island, while Wyannie, the daughter of the widow Malone, married Jacob Adams of South Carolina, who had accompanied them in their migration. From this stock most of the present inhabitants of Hopetown have descended, and the names of Malone and Russell are constantly met with throughout the settlement.

Explanation of Chart.

With the aid of Rev. R. C. Johnson, a clergyman in the settlement, and Captain Samuel Malone, one of the old inhabitants of the village, Mr. Gillmore and I were able to construct a diagram of the Malone family showing the lines of descent since the appearance of widow Malone in the settlement. In order to study intelligently this family tree, which is shown on Plate LXXVI, a word or two of explanation may be necessary. The lines of descent start from the right-hand side of the diagram, with the name widow Wyannie Malone. To the left, her five children are placed, two of whom disappeared from the settlement, while the marriages and descendants of the other three who remained are indicated. Next, or to the right, are shown the descendants of the grandchildren of the widow Malone, and their marriages are in turn indicated. In this way the descent runs progressively towards the left. In the early history of the settlement "Old" John Albury, of Harbor Island, and Nathaniel Key, of St. Augustine, Florida, settled in Hopetown. As they were already married when they arrived in this settlement, they brought in new blood, but their offspring in a short time closely intermarried with the descendants of

widow Malone, so that the relationship between the thiee families became very close. The family charts of Nathaniel Key and "Old" John Albury are introduced in the general diagram immediately above the legend. It will be noticed that only a few of the descendants of widow Malone are indicated as having married. By this it is not meant that the others did not marry; many of them did, but they moved away and settled elsewhere, and in no way affected the future history of the settlement of Hopetown. Only those marriages are indicated in which the children remain and lived to intermarry in the settlement. The red lines on the chart connect the same individuals, and are introduced to facilitate the reader in tracing relationship. They indicate at a glance the enormous amount of intermarriage between the various members of the Malone, Russell, Albury, and Key families of Hopetown. In order to further aid the reader, diseases and abnormalities are printed in red and are placed directly under the name of the individuals afflicted. It will be seen at a glance that early in the history of the Malone family these indications of degeneracy were absent; but they began in the fourth generation and rapidly increased afterward until they culminated by the presence of five idiots in one family. The original stock was apparently excellent, but the present state of the descendants is deplorable. A few of the more striking cases of disease and degeneracy at Hopetown will now be discussed.

Special Cases of Degeneracy.

Leprosy was introduced into this settlement in the third generation through the marriage of Elizabeth Malone, daughter of Ephraim Malone, to Charles Sands of Cherokee Sound, Abaco, who subsequently died of leprosy. Three of his children, Charles, Uriah, and Romelda had leprosy. Romelda married Octavius H. Dorsett of Nassau. One of their children, Charlotte Dorsett, developed leprosy and died of the disease. These facts would seem to favor the theory that leprosy is transmitted by inheritance, but the same facts might with equal force be presented to uphold the theory that leprosy is contagious. The two lepers now living at Hopetown, Francetta and Absalom Malone (Plate LXXI, Figs. 1 and 2), are not directly related to the family just described.

In the family of William Albury who married Elizabeth Tedder, two children out of four are deaf and dumb. Another interesting case is the family of Joseph Malone. Joseph married Virginia Malone; their daughter, a little girl of 7 years, is a congenital idiot and the father has developed

locomotor-ataxia in the ataxic stage. Benjamin C. Malone, son of August Malone and great-grandson of the original Ephraim Malone, was another congenital idiot (Plate LXXV, Figs. 1 and 2), of a somewhat lower type than the little girl just described. In addition he showed flaccid paralysis of the left arm and hydrocele of the scrotum.

In the family of William Alonza Russell, we found three cases of congenital blindness, in three robust young men, ages 32, 23, and 17 (Plate LXXIII, Fig. 2). These boys were born blind and on examination showed the very faintest light perception. As has been said, one of the boys came to Baltimore the year following our visit, and we were able to make more thorough investigation into the condition of his eyes. He was taken to the office of Dr. J. J. Mills, an eye specialist connected with the Johns Hopkins University, who kindly examined his eyes for me and diagnosed the condition as one of optic atrophy, associated with a pigmentary retinitis, and choryditis. This condition is one stated by the authorities to be due to the effects of consanguineous marriage.

In another family, mentioned above, that of Mrs. Sawyer, we found that out of eight children, five were idiots. Two of these, who were women fully grown, ages 40 and 27 (Plate LXXIV, Fig. 7), were carefully studied and head measurements taken. Their cephalic indices were normal, and with the exception of showing rather broad palates, and in one instance extreme protrusion of the front teeth, nothing unusual anatomically was detected. They represented, nevertheless, an extreme degree of idiocy, and were just able to articulate slightly, say "yes" and "no," and express their wishes in a slight degree. An interesting point in the history of these girls was the insanity of their aunt, Mrs. Russell, who lived in the house with them and suffered from chronic melancholia. The mother of these two girls (Plate LXXIV, Fig. 2), seemed to be a fairly sensible individual, in spite of the harrowing fact that so many of her children were born idiots. In regard to whether these children showed mental defects when very young or somewhat later, I could not be perfectly certain. The mother said that "all of them appeared stupid as early as she could recollect."

I was impressed with the information given me that child-birth is a great danger to the women of Hopetown, and that many die as a result from some abnormality taking place during confinement or labor.

Cause of this Degeneracy.

From a careful consideration of the facts just mentioned I am strongly of the opinion that the deplorable state of degeneracy which we observed at

Fig. 1.—View of lazaretto at Nassau

Fig. 2.—View of typical home of colored people

VIEWS ILLUSTRATING SANITARY CONDITIONS

Hopetown has been in a great measure, if not entirely, brought about by too close intermarrying of the inhabitants. In the case of lower animals, to be sure, it has been found that interbreeding is not productive of disastrous results if the original stock is good, and all abnormalities are excluded. Although many authorities hold that this law applies as well to the human species as to the lower animals, I cannot conclude that close and continued intermarriage among human beings is unattended with evil results, for we can never be certain that the same conditions are followed in the reproduction of the human species as are enforced in the breeding of animals. The organization of the human being is so complex, and the nervous system so delicately balanced, that it is difficult, if not absolutely impossible, to establish a human type, and to agree as to what constitutes good human stock. Nothing is more difficult than to find a perfectly normal man or woman, and if we cannot agree as to what constitutes a normal type, how are we to decide as to what constitutes an abnormality? In a sense, a genius is as abnormal on the one hand as an idiot on the other, and it is impossible to draw a line between a being with normal mental capacity, and one which is slightly below the standard.

One cannot conduct artificial experiments on the human race similar to those carried on with lower animals. Except within very narrow limits, marriages are not regulated by law, and therefore abnormalities, if they occur, cannot well be eliminated. The volition of the interested parties is practically the only check on the propagation of abnormal types. As the selection of a companion is not based on scientific but on sentimental grounds, and the field of the observation of most men is small, the great majority select their life partners from a comparatively limited acquaintance. The smaller and more isolated the community, the more restricted will be the horizon of the individuals who compose it, and the closer will be the intermarrying. If the laws governing the descent of lower animals are identical with those governing the descent of the human race, the conditions under which they act are far different. In restricted communities, then, an abnormality or a disease will tend to be perpetuated, exaggerated and concentrated.

In Hopetown we have an ideal illustration of what a small and restricted community of human beings will do. Here is an experiment conducted by Nature, as it were, to show what will result from close intermarrying, where the volition of the interested parties is the only check on marriage. Marriages here are largely determined by propinquity, with the result that close intermarrying without the elimination of abnormalities has been productive of

a shocking condition of degeneracy. For all practical purposes, then, it would seem, as the rules for the breeding of lower animals cannot be enforced among human beings, that close intermarrying should be rigorously avoided. As a factor in producing abnormalities, one must not neglect poor living and hygiene which are common at Abaco, but the factors of syphilis and alcoholism seem to be eliminated from this instance, for a case of alcoholism is rare, and of the large number of individuals I examined, I did not detect a single case of syphilis.

Recommendations Regarding Hopetown.

The question arises as to what can be done to relieve the condition of these unfortunate people at Hopetown. At once the idea of bringing in new blood suggests itself. Owing, however, to the fact that leprosy is present in the settlement, the carrying out of this suggestion might be productive of evil to the new blood introduced, especially as we are ignorant of the manner in which leprosy is transmitted. On the other hand, there is no reason to believe that the people, if left to themselves, will do in the future otherwise than they have done in the past. Future generations will sink to even a lower state of degeneracy than at present. To leave a community to gradually exterminate itself by intermarrying would seem to be worse than running the risk of producing an occasional leper. It might be well, therefore, for the people of the Bahama Islands—*First*, to empower the proper authorities to remove and isolate from the settlement all lepers and all whom they have reason to suspect may in the future develop leprosy; *second*, to remove all idiots and degenerates to an asylum; and *third*, after this has been accomplished, to introduce new blood among the inhabitants.

TREATMENT.

Before giving a brief summary of the methods employed by the medical staff in treating the various diseases cited above, it will be interesting to describe some of the remedies used by the poorer natives in the outer islands.

One of the plants, which is boiled and the decoction used for the dressing of wounds, is called "cat-tongue" by the natives. Another plant, the white-bush, belonging to the croton family, was used in kidney troubles, and another, called "snake-root," not identified, used in malaria. We also found on these Islands specimens of the "jumby" bean. This bean, when eaten by

mules or horses, causes the hair of the mane and tail to fall out, giving a rather remarkable appearance to the animals, who have been so unfortunate as to have the bean as a diet.

At some of the islands, we found hanging to various fruit trees, fantastically draped bottles and sticks, which, we were informed, were charms to frighten away thieves and evil spirits. This superstition, called "Obiism," is quite common in the outer islands. It is believed by the negroes that if any one but the rightful owners should eat the fruit from a tree on which this spell has been placed, he will swell up and burst. We were not fortunate enough, however, to see a demonstration of this remarkable effect.

Our own treatment of the natives, which has been somewhat outlined in the previous pages, consisted first, in operations of various kinds when these were not of such a nature as to call for a prolonged halt of the Expedition, and second, in the administration of various appliances and drugs adapted to the conditions encountered. In a number of instances where the children or the older people were afflicted with stomach disorders, we would leave a liberal supply of malted milk, albuminized food, and other medicines, such as gentian, dilute hydrochloric acid, etc., with directions for treatment, in the hands of competent persons, such as the minister or better informed people in the community. In the cases of nervous disorders, we employed the usual remedies, such as strychnia, arsenic, iron and iodide of potash; in malarial fevers, quinine; in the enteric troubles we were especially pleased with the action of the new remedy, acetazone, and also employed various other intestinal antiseptics, such as lead and opium pills; in lung diseases we used various cough mixtures, and especially liked liquid peptonoids and creosote. As a general rule, the hypophosphites with iron, quinine and strychnia were the most serviceable. Constipation was relieved with the usual remedies, such as calomel, pills of aloin, strychnia, and belladonna, and in the case of the members of the Expedition I found the compound rhubarb pill of the British pharmacopeia to be the most serviceable, for the reason that the rhubarb has a slightly astringent action after its purgative effect and is not liable, for this reason, to start up a diarrhea which cannot be stopped. For the various intestinal worms, santonin and male fern were employed.

GOVERNMENT HOSPITALS.

It must not be concluded from the preceding discussion that the people of the Bahama Islands are doing nothing to relieve the afflicted in their midst,

for such is not the case. There is at Nassau a well conducted hospital and insane asylum, an almshouse, and a lazaretto. Through the courtesy of the physician in charge, Dr. L. D. Parsons and his assistant, Dr. J. J. Culmer, I was permitted to examine these institutions and to study many of the inmates. According to the official report for 1902, the following diseases were treated in the hospital at Nassau:

Measles	1
Malaria	8
Tuberculosis	30
Tubercular leprosy	5
Anesthetic leprosy	4
Primary syphilis	7
Secondary syphilis	9
Tertiary syphilis	15
Alcoholism	5
Rheumatism	15
New Growths { Non-Malignant	7
New Growths { Malignant	5
Anemia	4
Old age	19
Neuritis	3
Myelitis	3
Apoplexy	2
Paralysis	8
Diseases of the eye	11
Diseases of the ear	3
Diseases of the nose	2
Diseases of the circulatory system	30
Diseases of the respiratory system, other than tuberculosis	26
Diseases of the digestive system	49
Diseases of the urinary system, males	27
Diseases of the urinary system, females	10
Diseases of the organs of locomotion	11
Diseases of the cellular tissue	22
Diseases of the skin	7
Local injuries	31
Poisons	3
Parasites	2

At the end of the year the hospital had 40, the lunatic asylum 29, the almshouse 40, and the lazaretto 8 inmates. (Plate LXVII and Plate LXVIII, Fig. 1.) These institutions are supported at the expense of the government. There are no private wards and treatment is free. Practically all of the cases mentioned in the list were from the poorest class of inhabitants on the Islands, and required a certificate, usually that of their minister, before they could gain admission to the institution.

HISTORY OF THE BAHAMA ISLANDS, WITH A SPECIAL STUDY OF THE ABOLITION OF SLAVERY IN THE COLONY

HISTORY OF THE BAHAMA ISLANDS, WITH A SPECIAL STUDY OF THE ABOLITION OF SLAVERY IN THE COLONY

BY

JAMES M. WRIGHT

INTRODUCTION.

Investigation of the history of the Bahama Islands has been almost entirely neglected. Abundant materials for such a study are in existence, but, except for a pamphlet entitled *The Bahama Islands; Notes on an Early Attempt at Colonization*, by J. T. Hassam, efforts to present the substance of these materials to the public have been lacking. Numerous short sketches of the Colony have been given in histories, and accounts of travels in the West Indies, such as Edwards' and Coke's histories, McKinnen's *Tour of the West Indies*, Froude's *Bow of Ulysses* and G. J. H. Northcroft's *Sketches in Summerland*.

The history of the Bahamas presents many interesting problems. Among them, perhaps the most important, is that of the social elevation of the negro population. When Great Britain attempted to ameliorate the condition of these people she dealt with her West Indian possessions as if they were one body, and applied the same measures to all of them, notwithstanding the fact that many of their interests were actually divergent. This problem of amelioration in the successive stages of proscription of the slave trade, the regulations of the institution of slavery, and the transition to freedom through the apprenticeship system, was a living issue for many years, while the latest phase of the question, to wit, the education of the liberated negro, continues to be of the utmost importance to the people of the Bahama Islands.

The author of this paper, who was a member of the Bahama Expedition of the Geographical Society of Baltimore, spent the summer of 1903 at Nassau collecting materials on the history of the Bahama Islands, and the results of his researches are here presented.

The despatches of the Governors and the Secretaries of State for the Colonies contain much information of great value, but there are certain gaps

in the records. None of those of the former, and only an incomplete file of the latter, for the period before 1829, are to be found in the archives of the Bahama government, although they are nearly complete after that time. The Governors' despatches are lacking also for more than a year in the period of the apprenticeship system.[1]

The author wishes to acknowledge the kindness of His Excellency, Sir Gilbert T. Carter, the former Governor of the Bahamas, of his Secretary, Mr. H. S. Gladstone, of Mr. S. H. O. Clutsam, custodian of the records of the House of Assembly, and of other officials of the government, in granting him access to the public archives, and in furnishing him information that could not be gained from the records. Acknowledgments are also due to Professors John M. Vincent and W. W. Willoughby and Dr. J. C. Ballagh, of the Johns Hopkins University, for counsel and criticism in the prosecution of this study.

HISTORICAL SKETCH OF THE BAHAMAS PRIOR TO THE NINETEENTH CENTURY.

The landfall of Columbus on his first voyage to America was one of the Bahama Islands. The question as to whether it was the present San Salvador or Watlings Island on which he first set foot is still a matter of controversy, and from evidence that has been brought to light it would seem that the dispute can never be definitely settled.[2] But this coincidence, interesting though it is, influenced little the later history of the Bahamas. At the time of the discovery the Islands were inhabited by Indians who received the name

[1] The chief sources used in writing this were:

Votes of the House of Assembly.

Votes of the Council (on the Legislative side).

Despatches of Governors to Secretaries of State for the Colonies. (1829-1849).

Despatches of Secretaries of State to the Governors. (1815-1849).

Miscellaneous Letters of Governors. (1838-1851).

Royal Gazette (Newspaper published at Nassau).

Session Papers of Parliament.

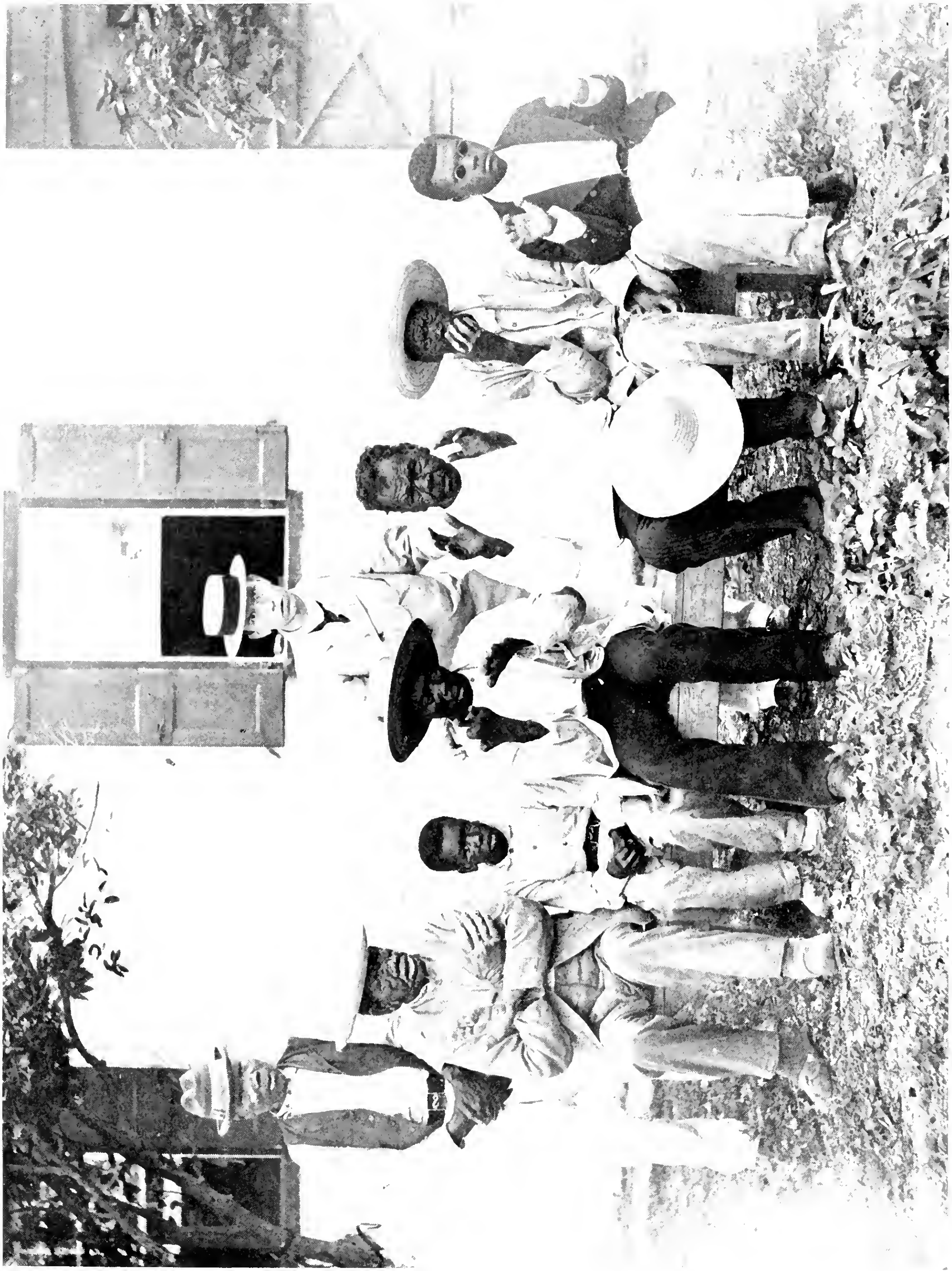
Relating to Slavery and Abolition, 1831-2, 46; 191, ff, and 297, ff; *loc. cit.*, 20, questions No. 2811 to 2863; also 1836, 49 and pp. 502-547.

Relating to Land System and Apprenticeship, 1839, 35, 143, pp. 1-42; *loc. cit.*, 37, 487, pp. 1-20.

Annual Register.

Bahama Statutes.

[2] See discussion of this question by Fox in an article entitled "Attempt to Solve the Problem of the First Landing Place of Columbus in the New World," in *U. S. Coast & Geodetic Survey Repts.*, 1880, *pp. 346-411.*



GROUP OF LEPERS, WITH ATTENDANT PHYSICIAN, FROM LAZARETTO AT NASSAU

of "Lucayans." Subsequently the Spaniards came and enticed them away, or forcibly deported them, to end their miserable lives in slavery in Spanish mines at Hispaniola and elsewhere. It is said that the Spaniards returned again and again to the Bahamas to kidnap the Indians until the Islands were completely depopulated of their native inhabitants, and left desolate. This may be too strong a statement of the case, but it is certain that there are no Lucayan Indians living in the Bahamas to-day, nor are there any traces of Lucayan blood to be seen in the present inhabitants. The Indian as an element in the population has completely vanished, and the only trace of his former existence in the Bahamas is the occasional discovery of Lucayan bones in lonely caverns scattered throughout the archipelago. Most of these remains have found their way to various museums in America, but a nearly perfect skull is now on exhibition in the Library at Nassau. A glance at this skull (Plate LXXX) will show that the Lucayan Indians possessed considerable cranial capacity, although they practiced artificial flattening of the head.[3]

Another thing that attracted Spanish adventurers to the Bahamas was the fabled Fountain of Youth reputed to be located in or near them. The aged Ponce de Leon, who was guided to the Bimini Islands in 1513, actually bathed in a fountain there but was forced to turn away a disappointed man, without the restoration of his youth which he so much desired.

The title to the Lucayan Islands, as the Bahamas were first called, which was given to the Spaniards by the Pope, was not left undisputed. English sea-rovers haunted the West Indies in order to prey on Spanish commerce, and pirates who early resorted to these waters and rapidly increased in numbers, found among the keys of the Bahamas, havens of retreat where they could easily elude the clumsy Spanish galleons.

In 1578, Queen Elizabeth granted Sir Humphrey Gilbert a title to lands in these parts not occupied by subjects of any other Christian power. Sir Humphrey included the Bahamas in this grant, although he made no attempt to settle them. But on October 30, 1629, another grant including the Bahama Islands was made by the sovereign of Great Britain, this time to Sir Robert Heath, the Attorney-General. A few colonists were sent out under this patent and a settlement was formed on New Providence. This settlement was ill-fated, for the island was visited in 1641 by a force of Spanish seamen and

[3] For further discussion of Lucayan Indian remains, see paper by Prof. W. K. Brooks, *On The Lucayan Indians*, National Academy of Science, Vol. IV, pp. 215-222, Pls. I-XII.

the small band of Englishmen was captured and carried away. The place was then taken possession of by the Spaniards and held for about twenty years.

In the meantime, while the Spanish were still in possession of New Providence, a band of religious exiles, driven out from Bermuda, sailed southward to the Bahamas in 1649 and founded a settlement on the island of Eleuthera.

The colony at New Providence did not attract a large number of settlers. It had a small force of defenders, generally less than fifty in number, and was consequently a prey for the spoiler. It was taken from the Spaniards in June, 1666, and Major Samuel Smith was sent from Jamaica with a small force to hold and govern it in the name of the King of England. The Spaniards assailed it again but without success and it continued in the hands of the English. Sir James Modyford, a brother of the Governor of Jamaica, was commissioned as Governor of the Bahamas in 1666.

The efforts to colonize these Islands had thus far had meager results. Little had been done to secure peace and safety. A more dignified effort was authorized by Charles II in 1670 when he granted the Lords Proprietors of the Carolinas a charter for the establishment of a government in the Bahamas and charged them to give these Islands the same kind of government as the Carolinas. Captain John Wentworth was made Governor in 1671 with instructions to choose a Council which should propose bills to the local parliament for passage. He was further instructed to permit no person either to cut braziletto wood without license except on his own estate, or to coast for ambergris or wrecks, or fish for whales without license. In the following year the new Governor complained to the Governor of Jamaica that his colony of five hundred souls had been left without the means of protection, and that the Proprietors had issued no commands to him about it. He also asked for supplies from Jamaica. The need of more adequate defenses was shown in January, 1684, when a number of Spanish ships from Havana under Juan de Larco captured and plundered the town of Nassau.

It would seem that the Spanish were not without provocation for this descent upon Nassau, for one Robert Clarke, who was Governor at the time, acting without authority from London, had issued commissions to privateers to prey on Spanish commerce. As soon as this insubordination was discovered in London, a successor was sent out with instructions to arrest Clarke and send him back to England for trial. But England was too late. Lilburne, the new Governor, was attempting to check the evils resulting from the conduct of his predecessor when the Spanish appeared and sacked the town. The

Spanish were now thoroughly angered. To their minds there were two reasons why Englishmen might be preyed upon: first, they were despised as heretics, and second, they had no rights in these seas and territories granted to Spain by the Pope.

Under such conditions trading became hazardous in the Bahamas and no Englishman could venture near them without a convoy. Protests were of no avail. The Spanish Governor-General at Havana only sent back defiant messages when appeals were made to him to put an end to the depredations. But the Spanish were not long to enjoy the possession of New Providence. The English Governor was soon restored, and, with his return to Nassau, a new period of piracy was ushered in.

Buccaneering was indulged in freely by the inhabitants of the place. For brief periods, to be sure, during the next thirty years attempts were made to preserve law and order, but without avail, as so large a number of the population was engaged in piracy or at least in sympathy with it, that it was not possible for the government with the force at its command to stamp it out. A law-and-order governor was intolerable to the rovers. If he would not join in, or at least connive at, their conduct, he would be taken prisoner and held by the pirates. In 1703-4, when a combined French and Spanish expedition took the settlement by surprise and carried away the principal inhabitants to Havana, the pirates reigned with a freer hand than ever before.[4]

Piracy with this settlement as a base became such a menace to the commerce passing through these waters that merchants in Great Britain pressed upon George I to put a stop to it. The Lords Proprietors, who had so poorly succeeded in their enterprise, surrendered their control of the civil government to the Crown, and in 1718 Captain Woodes Rogers, a hardy and fearless seaman, became Governor of Nassau. He restored order, punished or drove out the buccaneers and made the place a respectable one in which to live. He was supported with forces sufficient to establish his control, and with funds to make fortifications for security against invaders. The Colony prospered from this time, attracting numerous settlers, among whom was a company of German Protestants from the Palatinate. More extensive fortifications were undertaken in 1738 under the direction of Peter Henry Bruce, of the engineer corps of the Royal Navy. He has left an interesting account of his work here in his memoirs.[5]

[4] Northcroft, Sketches of Summerland, pp. 274-282.

[5] Memoirs of Peter Henry Bruce.

In 1775, Commodore Hopkins, of the new American navy, captured Nassau, evidently expecting to secure possession of the stores of powder deposited there. Failing in this, owing to the vigilance of the Governor, he sailed away a few days later taking the Governor and a few others as prisoners of war. Only a small force of defenders remained throughout the remainder of the American Revolution.

In 1781 the Spaniards appeared at Nassau again, defeated the British, and kept a large garrison there for nearly two years. After the conclusion of the treaty of peace between Great Britain and Spain in 1782, but before it had been announced in the Southern States, an expedition organized by Loyalists from the Carolinas and Florida took Nassau from the Spaniards. This expedition was undertaken as a private enterprise by Major Andrew Deveaux and Captain Daniel Wheeler. A few recruits had been picked up at Harbor Island and several vessels that were met on the way joined with the party. By this small party, of not more than 225 men, the Spanish Governor was taken by surprise and induced to surrender a force nearly three times its size. Deveaux took possession with a garrison of fifty men and sent part of the Spaniards to Havana.

Upon the separation of the Thirteen Colonies on the continent from Great Britain many of their inhabitants preferred to remain British subjects rather than become citizens of the States. The unpleasantness of their situation among the successful revolutionists was increased by the bitterness of the latter toward them. For these and other reasons many emigrated from the States to territory that still remained British. This exodus was encouraged by the favorable conditions offered to those who wished to settle in the Bahamas. Vessels were also provided by the Crown to bring to the Colony all who desired to leave the Southern States for British territory. On September 10, 1784, instructions were issued to Lieutenant-Governor Powell to grant unoccupied lands in the Bahamas as follows: To every head of a family forty acres, and to every white or black man, woman or child in a family, twenty acres, at an annual quit rent of 2s. per hundred acres. But in the case of the Loyalist refugees from the continent such lands were to be delivered free of charges, and were to be exempted from the burden of the quit rents for ten years from the date of making the grants. At about this time Governor Patrick Tonyn of east Florida gave public notice in that province that the last vessel transport would leave the port of St. Marys, Florida, on March 1, 1785. He advised all persons of English blood to leave Florida for the Bahamas before the Spanish Governor took possession.

It was not, however, without regret that some of the Loyalists left the continent. Fears were expressed that the Islands were not as productive as they were represented to be. It was a choice between the evils and dangers of living under Spanish rule and going to a colony whose resources were doubtful. Many, however, chose the latter, and came over, bringing with them their slaves. The white population of the Bahamas was doubled by these immigrants, and the negro population was nearly trebled. Many of the newcomers were cotton planters. These set to work at once with their slaves clearing lands and planting crops, and soon brought the Colony to some importance as a producer of cotton.

On the part of the older native inhabitants of the Colony there was a prejudice against the unfortunate exiles. Governor Maxwell was not above sharing in these feelings, and yielding to them in his official conduct. He was therefore disliked by the refugees. Upon his departure from Nassau an address of regret at his leaving was presented to him. It was alleged that the Loyalists acquiesced in the sentiments expressed in it. The spokesman of the latter, however, disavowed any connection with the address, and this denial was approved by a meeting of the Loyalists. They found abuses existing both in the laws themselves and in the administration of them. Some of the statutes, they said, were repugnant to the laws of the mother country. They accused the Governor of attempting to deny to them the right of trial by jury, a right which they considered as belonging to every Englishman in any British territory. They also accused the Governor of further oppressive and tyrannical conduct towards them. They demanded reforms, and claimed to have effected a reform in the administration of justice. The legislature was under the control of the native inhabitants. The election of 1785 had occurred before the Loyalists had begun to assert their power and they were in the minority in the House of Assembly. The Lieutenant-Governor, being unfavorable to the cause of the Loyalists, would not dismiss the Assembly and call another. Therefore the desired reforms could not be brought about. Several members of the House who were favorable to the refugees withdrew from the House rather than acquiesce in such conduct as that in which it indulged. The House required the attendance of some of them, and when they still persisted in their refusal to sit in it they were declared incapacitated for holding seats in that body.

When John, Earl of Dunmore, became Governor in the latter part of the year 1786, he too came under the influence of the same party that had sup-

ported Governor Maxwell, and did not respond favorably to the appeals of the Loyalists, who had now become the stronger party in the Colony. There was a general desire that the Assembly should be dissolved and a new one called. Petitions asking for this came to the new Governor from New Providence, Exuma, Abaco and Cat Island. In 1785 a like petition from the Loyalists was read in the House of Assembly. That body immediately ordered the document to be burned by the common hangman before the door of the House, as the majority of the existing Assembly was favorable to the policy of the Governor. The latter listened to the petitions of the Loyalists, deliberately considered them and replied that he did not consider it expedient to dissolve the Assembly. He persisted in his refusal and at the close of his administration the Assembly called in 1785 had endured almost nine years. After the departure of Dunmore from the government an act passed the legislature limiting the duration of a legislature to seven years, in order to obviate such a difficulty as that which the Earl of Dunmore had brought upon the Colony.

In 1787 the Lords Proprietors of the Bahamas surrendered their title to the lands of the Bahamas to the Crown on the payment of £2000 to each of them. The granting of lands and the collection of the quit rents became rights of the Crown. The quit rents were poorly collected at this time, and after the close of the eighteenth century they fell still further into arrears.

Although the Colony was prosperous for a number of years owing to the great stimulus given to it by the new immigrants, this prosperity was not destined to be permanent. The soil, which at best was thin, was exhausted of its strength by the middle of the first decade of the nineteenth century. Its value decreased, and with it passed away a great part of the value of the slaves that had been employed upon it. Some of the planters now emigrated with their slaves before the prohibition was laid on the exportation of slaves from British colonies. The restrictions on the holding and working of slaves were gradually tightened. Attempts were made to secure the right to emigrate with them, but no relaxation in these restrictions occurred. The interest of Bahama slaveholders had thus to suffer owing to the necessity of enforcing a uniform system of regulations against the slave-trade.

With this brief notice of the early history of the Colony we will now turn our attention to a more minute study of the conditions which brought such hardships to the slaveholders of the Bahamas.

AMELIORATION OF THE CONDITION OF THE SLAVES.

Abolition of the Slave-Trade.

In all of the West Indian colonies of Great Britain the slaves gradually increased until they composed the greater part of the population. Early in the history of each it had been discovered that the employment of slave labor was profitable, owing to the favoring conditions of soil and climate. The enterprising English merchants of the seventeenth and eighteenth centuries realized this, and also saw the opportunity of making great gains by supplying the settlements and plantations with the much-needed labor. The slave-trade, which began to meet this demand, grew to great proportions until it reached its height in the latter half of the eighteenth century. The trade in its mildest form was a barbarous illustration of man's inhumanity to man; nevertheless it was fostered under various guises by royal courts, and in addition to the lucrative returns to both trader and planter, the alleged improvement in the condition of its victims was put forward in its justification. The scenes where it was carried on were far removed from the mass of the English people, and the actual conditions under which it flourished were not well known outside of a very limited circle, until late in the eighteenth century, when the inquiring minds of the reformers began to investigate this trade as one thing that demanded their attention. Agitation against the slave-trade was begun and kept up, gradual accessions being made to the ranks of the reformers, until at the close of the Napoleonic period the whole world began to feel the influence of their labors in behalf of the negro. Public men of weight and influence were numbered among the enemies of the trade, and their demands for reform could be heard in the Cabinet, in the Houses of Parliament and throughout the country. For the British Empire the slave-trade had been abolished in the year 1807. Attempts had been made to make that abolition effective, but great difficulties had to be met and overcome. Nearly all the rest of Europe and the Americas were engaged in the enterprise and, besides, many Englishmen dared allow their capital to be used in it. The agitation of the reform party grew in importance with the passing of the years, the leaders gained increased audience among all classes, and the feeling against the now illegal traffic rose to a high pitch. Perhaps the most active agency in spreading the reform was the African Institution which worked in London, and which came into especial prominence in the years 1814-1815. This society had in view the amelioration of the condition of the

slaves in the British possessions, and the doing away with the slave-trade. Although it became the object of the hatred and of the anathemas of slave owners in the colonies, yet it bore an important part in the proscription of the slave-trade, as well as in the improvement of the condition of the slaves already in the colonies.

Having met with success in the British Empire it was necessary for the reformers, supported by the sympathies of the English people, to strike at the same evil in other countries in order to make effective the abolition within their own possessions. They went about their task in a masterful way and before many years success attended their efforts. Treaties were formed with the other European nations to put down the trade on the high seas, and attempts were made to get each nation to proscribe it within the territories and waters which it controlled. A nominal abolition of it was secured, but some of the nations, as Spain and Portugal, were backward in strictly enforcing the regulations made to destroy it within their own dominions.

Registration of the Slaves.

The effective means by which it was hoped to finally stamp out the slave-trade in the British colonies was the periodical registration of the slaves already in their limits. In this respect, as in its whole program in the interest of the slaves, the British Ministry, now dominated by the party of reform, strove to set an example which the rest of Europe might imitate. Great Britain had led in proscribing the commerce in slaves, she must also lead in giving effect to the abolition of the system. Registration was first urged in the imperial Parliament by Mr. Wilberforce and Lord Brougham, as a measure that should be passed, and applied at once in order to forcibly exclude the importation of slaves into the colonies by imperial regulations.[6] West Indian planters and slave owners residing in the mother country were on the alert immediately, calling upon those who supported their interests in Parliament to obstruct such legislation by every means in their power. Rumors of the proposals made to Parliament reached the colonies, where the feeling against such action was unanimous on the part of the white population. Whatever steps might be taken in the mother country to prevent the passing of such a bill were sure to have their approval. The West Indian merchants and plant-

[6] Ann. Reg., 1810, p. 145; 1815, p. 28 and pp. 87-88; 1817, p. 94.

FIG. 1.—TUBERCULAR LEPROSY IN ADVANCED STAGE

FIG. 2.—INCIPIENT TUBERCULAR LEPROSY

VIEWS ILLUSTRATING SANITARY CONDITIONS

ers in the city of Bristol presented a petition in 1816 deprecating the interference with the local institutions in the colonies.[7] In the Bahamas the tidings of the activity of the opponents of slavery and the slave-trade seemed to be unknown, or at least unnoticed, until the year 1815, when, on the return of some inhabitants of the Colony from London, information of the movement was brought to them. Two publications of the African Institution, one "*A Plan for the Prevention of the Unlawful Importation of Slaves*," the other a pamphlet entitled "*Reasons for Establishing a Registry of Slaves*," were laid before the local Assembly.[8] Wild misapprehensions at once beset the members of the House of Assembly. Almost total ignorance of the intentions and methods of the African Institution, or as to what Parliament might do, prevailed. It was only known that something was proposed to be done for the regulation of their slave property; it might be anything. In this state of mind the Assembly met in the summer of 1815. Dissatisfaction was expressed by some of the members at the failure of the Colonial Agent, George Chalmers, to keep their commissioners of correspondence informed of the progress of this dangerous movement. Believing that a total destruction of the slave property of the British West Indian colonies had been determined upon, regardless of the rights and interests of those concerned, the House decided upon an appeal to Parliament.[9] A committee set to work to inform the House of the progress of the movement for registration. It described the African Institution as a society "having no connection with, or interest in, the colonies, and ignorant of the conditions in the colonies, and of their local interests and usages," which had "put on foot ruinous schemes, and proposed colonial degradation and injury on a comprehensive scale." In behalf of the Bahamas, the committee denied the existence in them of the evils of which the reform party complained; denied that registration could remedy such evils if they did exist; and expressed their conviction that, according to English law, their "venerable charter of privileges" was to protect them from any such interference from outside the Colony.[10] The whole report is taken up with an arraignment of the abolitionists and a refutation of fancied arguments in favor of the registration. The presentation of it was followed closely by a set of resolutions on the rights of colonial Englishmen, which, together with the

[7] *Loc. cit.*, 1816, pp. 87-88.
[8] H. V., 1815, p. 105.
[9] H. V., 1815, p. 45.
[10] *Loc. cit.*, pp. 105, 106.

report, was forwarded to the Colonial Department at London to form the first part of the protest of this Colony against the registration system.[11]

Debates in Parliament.

On the floors of the English Parliament the registration question called forth serious debate. On the one hand, Wilberforce pressed the matter without questioning, in his own mind, the right of Parliament to take action, or the expediency of acting at once to suppress the trade; on the other hand, Lord Castlereagh suggested that it would be well to ask the coöperation of the colonial legislatures in excluding the slave-trade from the British possessions, stating that "nothing short of absolute necessity should urge the assertion of the right of Parliament to legislate for the colonies, and especially on a measure that would subject them to a tax without their own consent."[12] There was no change in the view of the leading spirits in the movement as to the power of Parliament to go ahead and make regulations as demanded by the extreme members, but the milder counsels prevailed so far as to determine the Commons not to act at once. The experience of the year that had just passed was sufficient to prove the folly of attempting to compel the slaveholding colonies to accept imperial regulation of so vital an institution as slavery. Parliament decided to defer in the matter to the colonial legislatures, each to act for the colony under its jurisdiction. The principles on which this legislation was to be based were to be laid down by the home government, and sent to the colonies as recommendations for the laws they were expected to pass.[13] These recommendations were at first mere outlines of the principal points on which it was desirable to obtain action from the legislatures; in time they grew to greater proportions and the program developed with the experience of the Ministry in dealing with the question, until finally they were brought to the necessity of sending out for the legislature exact detailed models of the statutes which the latter was expected to pass. Here began a struggle between the local governments of the colonies, supported by the Ministry and the moral influence of Parliament, on the one hand, and the local legislatures on the

[11] *Loc. cit.*, p. 164. A request to the Colonial Agent was to accompany these documents, to the effect that he should circulate them as a refutation of the charges that had been made against the West Indian slaveholders. The report stated that the Bahama people would resist to the point of emigration rather than submit to any such regulation by the home government.

[12] Ann. Reg., 1816, pp. 87-89.

[13] H. V., 1816, pp. 12-16.

other, which in the Bahamas continued for nearly fifteen years. At first the principal emphasis was laid on the need of registration, and within a few years a satisfactory registration system was secured in this Colony. The greater controversy, however, was over the remainder of the program of amelioration, a matter of much greater importance to the Bahamas, and it was not finally settled until the abolition of slavery by the imperial Parliament in the year 1833.[14]

Now that the duty of laying the question of a reformation of the colonial institution of slavery before the colonial legislatures devolved upon the Cabinet it was taken up at once, and recommendations were pressed upon the attention of these bodies. In the Bahamas the Colonial Department found an instrument to do its bidding in the Governor, Charles Cameron. Drawing from the instructions sent to him, he urged upon the legislature, with skilfully presented arguments, the consideration of, and action upon, measures for the exclusion of the commerce in slaves, and for general amelioration.[15] In the first place it was necessary to clear away the unfounded misapprehensions of the colonists as to the intentions of the leaders in the movement in the mother country, and especially as to the African Institution, in which the colonists could see every form of evil intention towards the colonies. The welcome intelligence that the manumission of the slaves was not intended by the authorities, was distinctly set before the legislature.[16] It was admitted that the character of the West Indian slaveholders and planters had been grossly misrepresented, but it was urged that the colonies now had a most favorable opportunity to redeem their bad reputation; that the intention of the King and the Ministry was to enforce the acts and treaties for abolishing the slave-trade, and that a refusal on their part would only serve to confirm the suspicions of their bad character.[17] It was also represented that the determination of the home government to permit local legislation in each colony for itself was a great concession and the legislatures ought to act the more cheerfully, since the legislation was to be by voluntary action of the colonies.[18] But the strongest reason for pressing these measures on this particular Colony

[14] In general the references on this last point are the despatches of the Governors and the Secretaries of State, the House Votes, Council Votes, and the local newspapers for the period 1815-1833.

[15] H. V., 1816, pp. 27, 28.

[16] H. V., 1816, pp. 12-16.

[17] *Loc. cit.*, pp. 12-16.

[18] *Loc. cit.*, pp. 12-16.

was that it was necessary to include it in a general registration system for all the West Indian colonies of Great Britain. These colonies were not allowed to trade with the colonies of foreign nations, although they could trade among themselves, and if any one of them, as the Bahamas, were left out of the registration system it might become an entrepot for traffic in slaves, and thus the whole of the British West Indian colonies could obtain a constant supply. This was the final and conclusive reason for the inclusion of the Bahamas in the general system of registration in the British colonies.[19]

Protest of the Bahamas.

On the part of the Colony there was no lack of arguments against the imposition of such a vexatious system. The legislature began with a complete denial of the existence, in the Bahamas, of the evils which the registration system was calculated to remedy, and easily came to the conclusion that there was no necessity for the registration of their slaves.[20] It was ascertained that the price of slaves had been greater in Cuba and Jamaica than in the Bahamas since the year 1810, thus showing the "absurdity" of registering Bahama slaves to prevent the importation of fresh recruits to the slave population of this Colony.[21] The value of slaves in this Colony had depreciated during the several years previous to this agitation.[22] The Assembly declared, however, that even if the evils complained of had existed, such a system as the proposed registration would not be sufficient to put a stop to it.[23] It was also argued that it would entail a great expense on the Colony by an unnecessary addition to the civil establishment:[24] that the measures Parliament had already taken for the suppression of the slave-trade were sufficient to put it down without the necessity of any action on the part of the Colony.[25] Finally the members of the House found themselves so firmly convinced of the inexpediency of the measure that they resolved not to become "the arbiters of the ruin of the Bahamas," and refused to act at all.[26] To the Governor, the House

[19] H. V., 1816, p. 27, portion of a letter from a member of the African Institution which the Governor laid before the Assembly.

[20] H. V., 1815, pp. 105, 106, and app., pp. 46, 47; 1816, pp. 101-103.

[21] H. V., 1816, pp. 83-101.

[22] *Loc. cit.*, 1815, app., pp. 46, 47.

[23] *Loc. cit.*, 1815, pp. 105, 106.

[24] *Loc. cit.* The item of expense without a return to the treasury of the Colony was sufficient to condemn any measure in this body.

[25] H. V., 1816, p. 103.

[26] H. V., 1816, pp. 117, 118. Address of the House to Governor Cameron.

freely expressed the slaveholders' opinion of the anti-slavery party in the mother country. After an exhaustive argument of the whole question to him they continued as follows: "With all due respect to Your Excellency's message, this Colony has already felt too deeply the baneful effect of the abolition influence in various ways not to regard with additional dread every new approach of that party to the pestilential dominion they are laboring to establish over the whole West Indies. Being persuaded that that party has visionary objects the House must declare that it will not be the arbiter of the ruin of the Bahamas."

The Wylly Affair.

This was the state of affairs and of opinion in the Colony, when an incident occurred which aroused such an excited state of feeling, involving the legislature and the whole local government in such difficulties that the possibility of legislation on the important matter of registration of the slaves was precluded for a term of four years.

In the year 1809 a female domestic slave, named Sue, was brought to Nassau from the State of Georgia. She was kept at Nassau until 1816. In the latter year her master came to Nassau, accompanied by a male slave, named Sandy, and attempted on his return to take the two slaves, together with an infant child of the former, back to Georgia with him.[27] The slaves absconded, were seized and imprisoned to await the day of their owner's departure. Attorney-General Wylly seized upon them, and prosecuted them on the ground of unlawful importation. Sandy and the child were restored to their owner, but Sue was condemned on an allegation that she had been offered for sale.[28]

The local House of Assembly, with its accustomed diligence in taking account of everything in connection with the government of the Colony, objected to the conduct of the Attorney-General.[29] It appeared that the Attorney-General had given a written opinion that, under the imperial statute of the year 1806 regarding the removal of slaves from any part of the British dominions, slaves brought into the Colony might be sold there, or freely taken away, according to the will of the owner. His new opinion, involving the use of license and bond for removals under the same act, was odious to the members of the House.[30] A report gained currency that the Attorney-General

[27] H. V., 1816-17, p. 143.
[28] *Loc. cit.*
[29] *Loc. cit.*, p. 153.
[30] H. V., 1816-17, pp. 153-156.

had been in communication with the African Institution in London, and was keeping that hated society informed as to the attitude of the Colony toward the Registration Measures.[31] The House determined to investigate the conduct of this official. When he was asked to appear before a House Committee he answered in terms that to the House seemed contemptuous. His arrest was ordered by a vote of the House—he should answer for his contempt of its summons and his misrepresentation of the proceedings of the House in the last session.[32] The House messenger reported a fruitless search for the person of the Attorney: and further that he had been resisted by armed slaves on the premises of the latter.[33] This was unbearable. Such "repeated and daring contempt," such a dreadful example to slaves to arm themselves in defiance of authority, decided the House at once on the downfall of the man who had dared to oppose its wishes. The Governor was asked to suspend him from office without delay. He was arrested and imprisoned, but within an hour thereafter he was delivered from the gaol by the order of the Chief Justice.[34] The House grew violent, and attacked the court for what it regarded as "highly unconstitutional, illegal, and unprecedented action" in releasing the prisoner. Again it ordered the arrest of the released prisoner.[35] At this point the Governor interfered with a proclamation dissolving the House.[36] In this course the Governor was supported by the home government.[37]

Three days after the dissolution of the House a public meeting was held at Nassau on January 31, 1817, which expressed unanimous approval of the action of the House. Resolutions were drawn up and adopted sanctioning the commitment of the Attorney-General, disapproving the conduct of the General Court, declaring that conduct unconstitutional and subversive of the rights of British subjects, further that it tended to the degradation of the House of Assembly from its unquestionable position of authority, and claimed for it the same position in the Colony that the House of Commons held in the mother country, therefore the superior of all courts. Apprehension of grave consequences, on account of the untimely dissolution of the House, pervaded these

[31] *Loc. cit.*, p. 157.

[32] H. V., 1816-17, p. 161. See also denial of Attorney-General in the *Royal Gazette* for Feb. 8, 1817.

[33] *Loc. cit.*, p. 167.

[34] *Loc. cit.*, p. 177.

[35] *Loc. cit.*

[36] *Loc. cit.*, p. 178.

[37] H. V., 1817, p. 17.

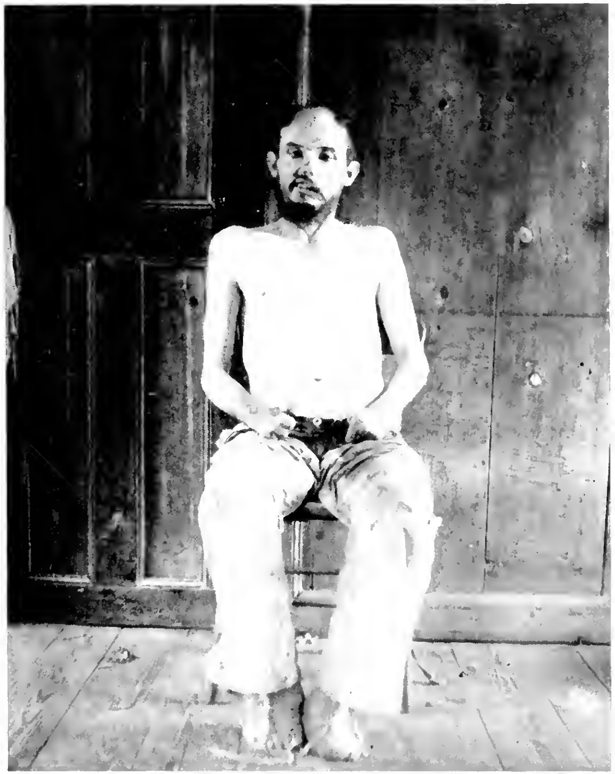


FIG. 1.—MAN AT HOPETOWN, ABACO, IN ADVANCED STAGE OF ANÆSTHETIC LEPROSY, SHOWING FACIAL PARALYSIS AND LOSS OF FINGERS AND TOES

FIG. 2.—WOMAN AT HOPETOWN, ABACO, IN ADVANCED STAGE OF ANÆSTHETIC LEPROSY, SHOWING LOSS OF FINGERS

VIEWS ILLUSTRATING SANITARY CONDITIONS

resolutions. People feared an uprising of the slaves, and there was such excitement that few local men could have spoken calmly of the situation.[38]

The next meeting of the local Assembly occurred in September of 1817. In the interval the people and the representatives, whom they had returned to the new Assembly, had not forgotten their grievances. It could scarcely have been expected that this body would have proceeded to business without any reference to the difficulties of the preceding winter; still it was hoped that an interval would serve to bring about a calmer state of feeling. But the new House was of no better disposition than the old one had been. After learning from the Governor that the home government had disapproved their unauthorized assumption of the power of imprisonment,[39] they adopted the same line of conduct that their predecessors had followed. The membership of this House was almost the same as that of the former, and their opinions had not altered a jot. Absolute supremacy within the Colony was their claim; they held that they were the sole judges of their own privileges,[40] and still confidently expected to be justified by the Prince Regent. They persisted in their endeavors to humble the Attorney-General, but without avail. Bills were ordered reversing the judgments in the Wylly case;[41] but the very same official personages, against whose action these measures were directed, also held seats in the Council which had a share in legislating. As judges of their own cause, they naturally threw out these bills.[42] The Provost Marshal who had assisted in the arrest of the Attorney-General was arraigned before the bar of the House to make an apology for his conduct in that affair which he had made public.[43] A bill for the registration of the slaves was passed, but it was intentionally framed so that neither the Council, Governor, nor home government would accept it.[44] Not least of these attempts to shift to the Council the responsibility for the lack of legislation was the passage of an appropriation bill omitting provision for the salaries of the Attorney-General and the Justices of the General Court.[45] They resolved not to pass any legislation at all, except for the purpose of preserving the public credit, and for the reëstablishment of their own

[38] *Royal Gazette*, IV (1817), No. 337.

[39] H. V., 1817, pp. 17-18.

[40] *Loc. cit.*, p. 20.

[41] *Loc. cit.*, pp. 34-36.

[42] *Loc. cit.*, p. 109.

[43] *Loc. cit.*, p. 38.

[44] H. V., 1817, p. 109.

[45] H. V., 1817, p. 128, address to the Prince Regent. The salaries of these officials were rarely granted for longer than one year.

privileges, until the several judgments of the General Court and its orders should have been so effectively annulled as no longer to have the authority of a legal precedent.[46] The Governor was at last informed that if he did not feel authorized to relieve their embarrassing situation, the House would do nothing further during the session than to formulate an address to the Prince Regent for a redress of their grievances.[47] Nothing further was attempted. A few days later a prorogation was proclaimed. Time would now be given for excited feelings to become quieted. Throughout another session the House of Assembly had adhered to its determination to outwit every other authority in the Colony.

Before another session of the Assembly occurred Governor Charles Cameron had been removed from the government of the Bahamas. He was succeeded in the temporary administration of the Colony by Chief Justice Munnings, who was President of the Council. He was the same official against whom the same House had acted so violently during its last session.[48] His position as temporary administrator did not make for peace with the House. The members of that body were sadly disappointed that a favorable response to their claim was not communicated from the home government. On the other hand, they were informed that the Prince Regent had instructed the Secretary of State to communicate to the Bahama House of Assembly that he fully approved of the conduct of the General Court in issuing the writ of habeas corpus on behalf of the unfortunate Attorney-General, for a recommitment would have meant that the original imprisonment had been according to law.[49] The House on its part spent a great part of this session in committee of the whole discussing the matter, in order to ascertain the best means of securing a redress of its grievances. It was unyielding in its attitude towards those who had offended against it,[50] and was still determined to refuse to act on the affairs of the Colony until its assumed privileges were secured to it. Instead of proceeding to business it passed another set of resolutions reviewing the difficulties, and voted to have the Attorney-General brought before it on the 14th of July.[51] When it met on that day it was at once summoned to the

[46] *Loc. cit.*, pp. 34-36.

[47] *Loc. cit.*, p. 116.

[48] It might be questioned whether those meetings were a "session" of the legislature. Some authority has said that there must have been some business done in order to entitle the meetings of the Assembly to the name of a "session."

[49] H. V., 1818, p. 5.

[50] *Loc. cit.*, pp. 9-10.

[51] H. V., 1818, p. 20.

Council chamber to meet the President of the Council. He upbraided the members of the House for their opprobrious conduct, warned them that he could not suffer them to oppress an individual any longer, and prorogued them, soon to follow up this with a dissolution.[52]

Another fruitless attempt to harmonize the branches of the government was made in March of the following year, on the meeting of the new House whose election had occurred meantime. It was found that this body also was as little disposed to compromise as either of the two that had sat before it. The same results were met with. But there was an additional grievance at this time, in that members of the House of Assembly had been summoned for service on juries. The House claimed for its members exemption from jury service. If the claim was well grounded, this was a breach of the privileges of its members.[53] A prorogation followed.

The "Healing Act."

Before another meeting of the legislature took place there was a fortunate change in the Executive of the Colony. Major-General Lewis Grant had been sent out as Governor of the Bahamas. The opportunity of the new Governor, who had had no part in the struggles of the preceding years, to act the part of mediator, was taken advantage of with the happy result of a restoration of the accustomed quiet to the community. The session had only opened, however, when the House rehearsed the whole matter in an address to the new Governor.[54] Some of the members of the House suspected, when they did not receive the desired response from the Prince Regent, that their addresses had never been laid before him at all. To them the new Governor replied firmly that the home government had no intention of granting that the House was in the right in its determination that the General Court, the Council, and the Attorney-General should bow to its will;[55] further, that there was no change in the views of those who had made the former assurances to the House. The Governor had been instructed that it was not necessary to require of the House any acknowledgment that it had acted in an unconstitutional manner in its conduct towards the other branches of the government. He desired to pass over the whole difficulty, to allow it to drop out of notice, and to proceed to

[52] *Loc. cit.*, pp. 33-35.
[53] H. V., 1819, p. 36.
[54] H. V., 1820, pp. 26, 27.
[55] H. V., 1820, p. 26.

business without any further reference to it.[56] He assured the House that if it desired to pass a bill embodying the sentiments which he had expressed, he would have no hesitation in giving his assent to it.[57] Accordingly the House passed a bill, which became the first act of the Bahama Legislature in the reign of the new Sovereign, declaring that neither the arrest of the Attorney-General under the warrant of the Speaker of the House, nor the bailments of the General Court setting him at liberty, should be taken to have the authority of legal precedent, or to extend, or diminish, the rights and privileges of the House of Assembly, or of the General Court.[58]

But the House was not yet satisfied. This "Healing Act," as it has been called, was passed only by the casting vote of the Speaker of this unconquerable body. Assurance that they had made no concessions must be made doubly sure. By a vote of 17 to 8 the following resolution was passed: "The House cannot consistently with its dignity, and never will, grant salaries to said persons (William Wylly and the Justices of the General Court), or any of them, either for past services since the commencement of the aforesaid disputes, or for any future services."[59] By a vote of 22 to 2 it was resolved that the House would still claim the right to imprison whomsoever it chose for the breach of the privileges of its members, and that it should remain the judge of those privileges. It also reasserted its claim to superiority to the courts.[60] On account of the persistently violent attitude of the House in all these matters,

[56] H. V., 1820, p. 28. Address of the Governor in reply to the message of the House. The Governor said: "I am authorized to state that under all the various circumstances attending the arrest and commitment of a certain public character, while His Majesty, on the one hand, cannot sanction by a direct admission of legality the proceedings against that individual, His Majesty, on the other hand, does not require any acknowledgment from the Assembly that they have advanced any novel or unconstitutional pretensions."

[57] *Loc. cit.*

[58] 1 Geo. IV, 1. This statute is retained on the statute books of the Colony to the present day. It declares in express terms that there has been no acknowledgment that the House had advanced any novel or unconstitutional principles. The citation to 1 Geo. IV, 1 refers to the statutes of the Bahamas. Thus all citations of statutes will refer to the Bahama statutes unless otherwise noted.

[59] H. V., 1820, p. 36. The original motion in this matter was to the effect that the House ought not to be deemed to be pledged to grant these salaries after the passage of the "Healing Act." As that was not strong enough to express their feeling it was changed.

[60] *Loc. cit.*, p. 38.

the Governor determined at once upon a dissolution of it.[61] The matter was hushed up finally with the termination of this session of the legislature, except for a proposal in the spring of 1821 to the effect that conciliation would not compromise the dignity of the House. The change for the better in the feeling of the House is shown in the failure of this motion. There was almost a two-thirds majority against it.[62]

Adoption of the Registration System.

The four years spent by the House of Assembly in its persecution of the other departments of the local government had meant four years delay in the establishment of the system of registration for the slaves. During the struggle a bill had been passed, which, however, did not meet the approval of the home government.[63] It did not provide for the forfeiture of non-registered slaves, nor did it provide for an accurate description of the slaves such that they could be identified, as was desirable to the British Ministry.[64] Other minor objections were laid before the Assembly with an urgent recommendation that an improved bill be passed. The Bahamas had always prided themselves on their loyalty to the British Crown. In his appeal to the House to pass a suitable bill for registration, Governor Grant urged that they should not pass a bill that would have to be disallowed, thus appearing to justify the imputation against them that the Bahamas were disregarding the wishes of the King.[65] The House finally yielded and passed a bill, granting certain of the more important points that had been urged in the recommendations. It provided sufficient regulations for the removal of slaves from one colony to another. But there were defects in other parts that called for supplementary legislation to make the registration system satisfactory to those who were demanding it.[66] Although important concessions were made in this, for the sake

[61] *Loc. cit.*, p. 41. This session had begun about the middle of the month of November. The prorogation took place on November 30. The Assembly was prorogued to December 15, but on December 6 a proclamation of dissolution was issued.

[62] H. V., 1821, p. 22.

[63] H. V., 1821, p. 38. This bill when it was passed by the House of Assembly was not regarded even by the membership of the House as one which would suit the "visionary speculations of the dangerous party at home." *Loc. cit.*, 1817, p. 109.

[64] H. V., 1821, p. 38, despatch of the Secretary of State detailing objections to the House bill.

[65] H. V., 1821, p. 38.

[66] H. V., 1822, pp. 65-66.

of compliance with the recommendations of the Ministry, still there were legitimate objections to the imposition of this regulation upon the Bahamas, if the interests of this Colony alone were to be considered. Registration, as has been stated, was designed to work towards the suppression of the slave-trade. The foreign slave-trade had not been carried on in the Bahamas since about the year 1810, or perhaps before the British Parliament had abolished the slave-trade in British territory.[67] Crop failures, and the uncertainty as to the tenure of the lands which they held, were additional reasons for apprehension on the part of the Bahama slaveholders. Furthermore, the expense that would inevitably attend such an establishment in this Colony would be out of all proportion to the benefits to be derived from it. The slave population, here numbering 10,808, according to the registration of 1822, was distributed over seventeen islands and groups of islands, which extended over a distance of 600 miles of ocean. Most of the other West Indian colonies consisted each of a single island, or compact group of islands. No other colony formed such a chain as the Bahamas. Easy access to the seat of government, where the registration books were to be kept, was an essential condition to the successful operation of the system. Communication between the different islands of this government was so infrequent, and so difficult, as to render it practically impossible for the same system to be applied here as in the other colonies, unless by the assumption of an expense which the colonial revenues could not bear. Other features of this system were difficult to adapt to this Colony, owing to the varied occupations of the slaves.

Great Britain was taking the lead of the world in giving effect to her abolition laws. Her West Indian colonies were compelled to submit to the imposition of this regulation as one measure for this purpose. Not one of them could be excepted from it, for no door must be left unclosed by which slaves could be brought into the British possessions. The exception of one colony, however small, would have served for the introduction of slaves into all the colonies at a great profit to the carriers. The plan of the Ministry was to recommend to all the colonies the same system, and to insist on its adoption, and the enforcement of its regulations, until the introduction of slaves from the outside should be entirely cut off. Such a plan would allow no part of the

[67] H. V., 1815, app., pp. 46-47. It was claimed by local men in 1815 that the depreciation in the value of their slaves had amounted to one-fourth of their total value during the first decade of the nineteenth century. In 1825 it was estimated that the depreciation had amounted to £500,000 or one-half of the former value of this property. *Loc. cit.*, 1825-26, pp. 124, 125.

British Empire to be free from this registration system. The larger interests of the Empire demanded that the rules and regulations for the destruction of the slave-trade should be enforced in all portions of the domain, even at the expense of hardship, suffering and deprivation to a small part of that great Empire, even though the particular evils, against which efforts were directed, did not prevail there. In this view it was altogether desirable to include this Colony.

Demands of the English Public.

The demands of the English public did not stop here. This was really only the beginning of the great program that lay before their government. They regarded themselves as responsible for the condition of the slaves with which their ancestors had supplied the colonists. The British nation was responsible for the presence of slaves within British territory, and they should now assume the responsibility for the amelioration of the condition of those same slaves. But the object was not to ameliorate the condition of the slaves, and still leave them slaves. It was intended that by progressive measures they should be raised in the moral and social scale, and that they should be educated, as far as that could be done, until they were fitted for full enjoyment of the rights of British citizenship. The matter had been before Parliament for a number of years; it had been investigated by committees of Parliament; it had been discussed inside and outside of that body, and the conviction of the necessity of taking action grew firmer as time went on. The experience of the first years, in which attempts were made to legislate for this purpose, had convinced the authorities at home that the best way to accomplish the desired end was to secure voluntary action from the colonial legislatures in the enactment of the program of amelioration. As colonial authorities had to be employed in the enforcement of the regulations of the slave system, it would be best to have those laws imposed by colonial agencies.

The general outlines of what it was proposed to accomplish were set forth in a set of resolutions passed by the House of Commons. It regarded the following as the principal points in which the greatest improvements could be made: (1) The prevention of the flogging of female slaves; (2) effective and decisive measures to be taken for the amelioration of the condition of slaves; (3) by judicious and temperate perseverance in the enforcement of these measures, the House of Commons hoped to secure a progressive improvement in the slaves, such as would fit them for participation in the rights and privileges of British citizenship; (4) the accomplishment of this purpose at the earliest

period compatible with a fair consideration for the rights of private property.[68] Under the second of these heads may be grouped the details of the measures that were proposed. The negroes were to be instructed in the principles of Christian morality and religion, to be qualified for and given the right to testify in the courts of law, to be taught the sacredness of the marriage tie, to be secured against the forced neglect of it, to be given every facility in securing their own emancipation, to be attached to the soil, to be protected from too severe punishments, and to be given facility and encouragement in the accumulation of property.[69]

Besides maintaining that these reforms were only giving justice to the slaves from the humanitarian point of view, the Ministry attempted to point out to the colonists that from the point of view of the slave owner's real interests these things were also demanded. The state of feeling in the mother country, and the solicitude of the people for the slaves, were held out to the Assembly; and after the refusal of the Bahama House to act compliantly with

[68] H. V., 1823, pp. 35-37. Copy of these resolutions of Parliament.

[69] H. V., 1832, p. 17. The details of the plan are fully set forth in the Order-in-council for Trinidad, a copy of which is given in this place. This order was put in force in the Crown colonies. It is a document embodying a great many details in large volume. The Ministry had at first attempted merely the suggestion of the general outlines of what they desired of the Colony in the amelioration of the slaves. It was soon found that their suggestions were purposely, and deliberately, given a wrong interpretation by the colonial legislature. The latter affected to misunderstand the intentions of the home government, holding this in the way as a reason why the recommendations should not be enacted into their codes.

The more important provisions of the Trinidad Order-in-council were as follows: A protector of slaves should be appointed to reside at the capital of the Colony, and have there an office open at all times to give access to and hear complaints from the slaves; the protector was not to be interested in slave property by ownership, management or guardianship of the owners of it; he was to keep the records of the operations of the system, to attend all trials affecting the lives or property of slaves; and in all his functions he was to have the assistance of the Commandant of the military forces of the Colony. Sunday markets were to be abolished throughout the Colony; slaves were not to be allowed to work between sundown on Saturday evening and sunrise on Monday morning. The use of the whip or "cat" as a mark of the authority of the slave-driver was to be prohibited; only limited punishments were to be allowed to be inflicted each day; the flogging of females was altogether done away with; and strict records of punishments inflicted were to be kept on each plantation. With the consent of the owner, the Commandant of the Colony could issue licenses for the marriage of slaves; husbands and wives were not to be separated from each other, nor children under fourteen years of age from their parents. Slaves were to enjoy property rights, holding and inheritance, etc.; savings banks were to be established for the security of the property of slaves. The tax on manumissions was to be abolished; slaves were to be allowed to purchase their

these recommendations,[70] it was represented that there would be great disappointment in England if the Colony failed to act as it had been urged to do. In 1825 the House of Lords came to the aid of the Ministry by approving its conduct.[71]

When concessions were made by the House of Assembly, full acknowledgment was made that there was a disposition on the part of the Colony to improve the condition of the slaves.[72] It was represented that whatever improvements the local Assembly might make would be on the initiative of the Colony, and ought not in that case to be objectionable to the colonists themselves.[73] The repeal of objectionable features was as strongly insisted on as was the enactment of advanced provisions. The colonists pleaded that the custom of the community secured to the slaves most of the guarantees for protection on which the home government insisted. The Ministry, unwilling to trust to such an indefinite response, insisted on a statutory recognition of these alleged beneficent customs.[74] In this way alone could it be assured that the slave system was to be freed from the abuses which slaveholders themselves admitted to exist. West Indian proprietors residing in the mother country were consulted as to the practicability of the measures proposed, and the colonists were told that the recommendations met with the approval of this class.[75] Finally in pressing the matter upon the attention of the Assembly an appeal was made to the feeling of gratitude, which the colonists must have felt towards the mother country, for the benefits of British rule.[76]

own freedom, or that of their wives or children; manumissions by private contract were to be in writing and made to the protector. Slave evidence was to be admitted to the courts in all cases; and ministers of religion were to certify as to the qualifications of slaves to be put on oath. Cruelty to a slave was to cause the right of the owner to hold the slave to be put at the discretion of the courts; a second conviction involved the right of the owner to hold any slave at all; or of the manager of a plantation to hold the position of a manager of slaves. In slave trials the burden of proof was on the master. The protector was to make an annual report of the conduct of his office, the number of cases that came under his jurisdiction, etc. H. V. for 1824, pp. 38-70.

[70] H. V., 1824, pp. 36-37; 1825, p. 32, and 1826, p. 2.

[71] *Loc. cit.*, 1826, p. 2.

[72] H. V., 1824, pp. 36-37. This was small encouragement to a body of slave-holders who desired to be excused from acting at all.

[73] H. V., 1824, p. 34.

[74] H. V., 1824, pp. 34-35.

[75] H. V., 1825, p. 32.

[76] *Loc. cit.*

Attitude of the Bahamas.

Against the whole program the colonists brought a great many arguments—some worthy of attention, others not. It was objected to these measures, just as to the registration, that they were ill-adapted to local conditions;[77] that the advocates of them had never visited the colonies and did not know anything about what would be suitable for regulating the institution of slavery. As for what they had already conceded, they would consider that as no sort of pledge, that they would enact any further measures of the same character. Their practicability had first to be demonstrated, and for this reason the Bahama House at one time refused to proceed any further with the program.[78] The Ministry had desired to proceed too rapidly to please the colonists. The holders of this property considered it dangerous at any time to meddle with the slave institution in a way that would give any little encouragement to the slaves to rise up against the authority of their masters. Insurrections had occurred in some of the larger colonies, and the horrors of the insurrections in the neighboring island of San Domingo were still fresh in the minds of Bahamians. The Order-in-council gave the right of complaint in some matters to the slaves, which would truly have curtailed the almost absolute authority of the masters.[79] They pleaded for non-interference with their cherished institution. They argued that the existing slaves were the progeny of the slave property of their ancestors, who had first settled in the Colony on condition that the lands should be cultivated by negro slave labor, and that those slaves had been guaranteed to the planters by the English law forever; that if the English government took any measures that would lessen the value of, or tend to loosen their hold on, their slave property, it would be a breach of the promise made to the early settlers. They held it unlawful to deprive them of their property, or of the value of it, without indemnification. If by any act of the home government their slave property were caused to depreciate in value, the owners of it ought to be compensated for the whole loss. If involuntary labor, as it existed in the colonies, was a crime, it was the crime in this instance of the mother country and she ought to bear the penalty of it.[80]

The people of this small island community had never had to bear with any considerable interference from the outside. The House of Assembly had been allowed to assume control of almost everything in the Colony. The in-

[77] H. V., 1824, p. 89.
[78] H. V., 1823, p. 71, and 1824, p. 89.
[79] H. V., 1824, pp. 89-95.
[80] H. V., 1825-26, p. 124, resolutions passed on January 24, 1824.

FIG. 1.—SAMSON ROOKER, SHOWING SIX DIGITS ON EACH HAND

FIG. 2.—DWARF AT SPANISH WELLS

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habitants had much confidence in their rights as Englishmen, and we have seen that they carried their attempts at assertion of those rights to the extreme. Born and reared in the atmosphere of the institution of slavery, and accustomed to dealing with it as they pleased, they were averse to any interference with it at all, and they could not have been expected to submit without protest to such changes, in the order of things, as the British Cabinet proposed to them. They had inherited the prejudices which are almost universal, if not inevitable, in a state of society in which the interests of one class are subordinated to the interests of those above them. While they were willing to care for their slaves reasonably, it was difficult for them to acknowledge that any authority in the Empire had the right to continue, as the Ministry had been doing, in insisting on a line of action so obnoxious to them. Hence they used such adjectives as "unwarrantable" and "unprecedented" to brand the conduct of the authorities in the home government, and were extremely reluctant to act on their recommendations. The depreciation in the value of their slaves was used as an argument to prove the baneful effects of the agitation that had been carried on in England, the reflection from which had reached the colonies. The agitation did have some effect in this way, but the great cause of this depreciation was doubtless economic. The prices of slaves had gone down because of the worn-out condition of the lands of the Bahama Islands. There was no longer the same amount of employment for them that there had been at the beginning of the century.

Adoption of a New Slave Code.

In 1824 a statute was passed granting part of the reforms upon which the home government had insisted. It placed in the slave code some of the things which were claimed as the custom of the Colony.[81] At the following session of the legislature the House declined to make any further alterations in its slave code.[82] The matter was not allowed to rest, however, for the Ministry urged more strongly than ever the propriety of taking further action for amelioration.[83] In 1826 almost all of the recommendations of the home gov-

[81] 4 Geo. IV, 6.

[82] H. V., 1824, p. 95.

[83] *Loc. cit.*, 1826, pp. 18-28. The Secretary of State sent out a detailed statement of the whole plan of the desired enactment, the provisions of which he had grouped under eight heads. His persistency won with the House in so far that at once on the meeting of the legislature in October, 1826, a committee was appointed which brought in eight bills embodying what is was thought could be conceded under the eight respective headings proposed by the Secretary of State. They were not passed in this form however.

ernment in this matter were included in some form, in a comprehensive amendment to the consolidated slave law. It contained practically all that the Bahamas ever conceded in the enactment of regulations for the amelioration of the condition of their slaves.[84] A few minor points were added in 1829.

Legal Status of Master and Slave.

The legal status of slaves in the Bahamas, as defined in the statutes mentioned above, will now be treated under the following heads: I. What the code guaranteed to the slave, his rights and duties. II. What it guaranteed to the master, his rights and duties.

Rights and Duties of the Slave.

Under this head will be considered: Maintenance, right to hold property, marriage and family, civic rights, religious instruction, conditions and terms of manumission, holidays.

Maintenance.—The master was required to furnish to each of his slaves over ten years of age, one peck of unground corn, or an equivalent, per week. For each child under ten years of age, one-half of this allowance would suffice. Two suits of "proper and sufficient clothing" were annually furnished to each slave. In addition to these things the slave was entitled to a small quantity of land for his dwelling, and a garden.[85] The law of 1824 prohibited the manumission of aged and infirm slaves, but that of 1827 permitted manumission, and required the master in such instances to maintain his freedman until death.

Right to Hold Property.—Slaves were allowed to hold property. The code provided in general that "no slave on account of his condition . . . . shall be deemed incompetent to purchase, hold, alienate or inherit property, but shall be competent for the exercise of this right." The Receiver-General of the Colony was made a depository for money which slaves might wish to deposit for safe-keeping. The slave could bequeath such money by means of a will made by a simple declaration to that official. The property of a slave dying intestate was disposed of according to the laws governing any property of the character which he had left behind. Marriage revoked a will previously made. In default of legitimate heirs the reputed issue, and the relatives, of the deceased slave could take possession of his property. Lands in the possession

[84] 7 Geo. IV, 1, and cf. 10 Geo. IV, 13.

[85] 10 Geo. IV, 13.

of slaves were considered as personal estate, and were governed by the laws regulating the descent of landed property. The property of a slave was attachable for debt.[86]

Marriage and Family.—The Bahama slave code professed to encourage legitimate marriages among the slaves of the Colony, and between slaves and free blacks. The old custom of the Bahamas doubtless permitted many abuses of the marriage tie among slaves, although, later, Admiral Fleming stated that promiscuous concubinage was not allowed.[87] With a view to the religious and moral improvement of the slaves, it was attempted to promote the attachment of husbands and wives among them, and to prevent, as far as possible, polygamy and promiscuity of conjugal relations. The consent of the owner in writing or the publication of the banns in the regular manner was necessary before marriages were allowed to take place. A marriage between slaves was not permitted without the consent of the owners. Such marriages were conducted according to the laws and canonical restrictions of the established church of the Bahamas. The ministers of that church alone were competent to solemnize marriages. If there was no Anglican minister in the parish in which the marriage took place, the duty devolved upon the justice of the peace. In 1827, however, the privilege of celebrating marriages was extended to ministers outside the established churches of England and Scotland, but in each instance the Governor issued a special license.[88] Registers of marriages were kept. Very primitive ideas prevailed among these poor people as to the duties conceived by Englishmen, to be assumed when entering into the marriage contract. Regulations were made for the purpose of inculcating proper ideas as to the mutual obligations of husband and wife, and urging upon them the importance of remaining together when once united. The separation of families was forbidden under any circumstances. Neither husband or wife was salable unless the other was sold at the same time, and to the same purchaser. Children were not allowed to be separated from their parents until they had reached the fourteenth year. Alienation of slave property could be carried out only

[86] 10 Geo. IV, 13. Neither of the above questions appears to have been touched upon in the laws before 1824. Custom in this as in many other respects was doubtless very lax. 7 Geo. IV, 1, secs. 36-40.

[87] Sess. P., 1831-32, 20, p. 217. Testimony given in the West Indian Investigation of Slavery by Parliament.

[88] 10 Geo. 13. Several years after the abolition of slavery a difficulty arose at Harbor Island over the transfer by a Wesleyan minister to another minister of his denomination, of a license issued to him to marry two blacks.

in compliance with these regulations. They applied to reputed husbands and wives, and to reputed, as well as to legitimate, children.[89]

Civic Rights.—Not only were slaves not allowed to vote in the Bahamas, but it was late in the history of slavery when colored freemen were admitted to the exercise of the franchise.[90] Slaves were not allowed to serve in the local militia. Free blacks were also excluded from militia service until 1804. After that time there remained prejudicial restrictions on their exercise of that right, even until after the abolition of slavery.[91] The restrictions in respect to jury service were nearly the same as were those just mentioned in the same period.[92] Slave courts were regularly established by the later statutes on slavery, before the passage of which they had been institutions of rather bad character.

By a statute of the year 1805 the General Court was authorized to try suits for the freedom of slaves. As that court sat only in the island of New Providence, other measures were necessary for trials in the Out-islands. A magistrate in an Out-island was empowered to summon three free-holders to assist him, on sufficient evidence, and compel a master either to give up his claim to a slave, or to pay the expenses of sending the latter to Nassau for trial in the General Court.[93] All other cases on behalf of slaves, that were allowed to be tried at all, were tried in the lower magisterial courts, and later in the slave courts. A slave court was constituted in 1824 consisting of two justices and at least five jurors.[94] At their best these slave courts were poor instruments for the measuring of justice, according to the standards of English jurisprudence. It was difficult for a slave to get his case into court at all, especially if it were against some white person. It made little difference what were the grounds of his suit, or how serious they were to him, they were likely to be ignored.

The cause of the whole difficulty in this respect, which prevented the slave from getting justice, was that slave evidence was not received in the courts until almost the close of the period in which slavery existed. The question of the removal of this evil involved the reformation of the whole course of justice in the Bahamas. Slave evidence was either not received at

[89] 10 Geo. IV, 13.

[90] 47 Geo. III, 1.

[91] 36 Geo. III, 4; also Smyth's Ds., No. 140.

[92] 44 Geo. III, 10.

[93] 45 Geo. III, 20, and 7 Geo. IV, 7. From the state of opinion it is not probable that a strict application of this provision occurred in many cases.

[94] 4 Geo. IV, 6.

all in the courts, or it received so little recognition that, as long as the state of things existed, a slave could not secure a hearing before them, if the cause were to the prejudice of a white person. It was out of the question for them to exercise any control in the courts, and they were allowed little opportunity to furnish the evidence they had in cases that came up for adjudication, in order that justice might be done.

In 1784 it was provided that the evidence of slaves should be admitted against manumitted persons in all trials for capital or criminal offenses; but by the same law only Christian slaves were allowed to testify at all, and they only in suits for debt.[95] Slave evidence was the first point in which the local Assembly attempted to make concessions, in response to the ministerial demand for the amelioration of the condition of the slaves. But the effort they made to remove the restrictions on it would not argue strongly that they were convinced of the expediency of granting full credit to the testimony of a slave, when put on oath. The traditional prejudice of the whites against the admission of the blacks to civil rights is well preserved. After 1822 free persons of color who had been instructed in the Christian religion, and baptized, and who had been free for a term of three years, were admitted to give evidence in civil cases, the facts regarding which had occurred subsequently to the liberation of the person testifying.[96] In 1824 this same privilege was extended to all persons of color born free in the Bahamas, and to others born free outside the Colony, but who had been in the Bahamas for five years. But it was still denied to manumitted persons in cases of treason and felony, and offenses against the peace, committed previous to manumission, and in all cases, the facts in which occurred previous to the passage of this statute.[97] Another change was made in 1829. All slaves, who were not native Africans, who had been in the Colony for five years were admitted to testify in civil cases, and in criminal trials by indictment, on presentation of a registered certificate from an Anglican or Scotch clergyman that they could understand the nature of an oath. This did not apply to cases of libel against a free person, nor in cases which involved penalties on the defendants, unless the trial were by jury. No slave could testify against a white person charged with a capital offense, nor against his owner in any criminal prosecution, nor in any case involving the right of a slaveholder to a slave, or regarding an alleged

[95] 24 Geo. III, 1.
[96] 2 Geo. IV, 37.
[97] 4 Geo. IV, 2.

manumission. Slaves could testify against manumitted persons in all cases of offenses below felony. Manumitted slaves, who had been registered as competent to take oaths while slaves, were allowed to testify as to facts committed subsequent to such registration, but not on facts bearing "on the freedom of a slave, or the life, liberty or property of a white person," committed between the time of registration and manumission. Even then the courts were authorized to throw out all evidence of a slave whose character was bad, even when such evidence was not impugned, nor contradicted, by other and more trustworthy evidence.[98]

Wilful perjury of a slave on oath was punishable with fifty lashes on the bare back. A later statute imposed a hundred such stripes, branding with the letter "P" (for perjurer), and disqualification to testify again under oath, or to make a deposition.[99]

A slave in attendance at court was left in the custody of his master, when not actually on the stand. In cases of treason and felony he was placed in custody, unless the master entered into a recognizance to guarantee his attendance when needed.[100]

Religious Instruction.—The Bahama people seemed to have laid emphasis constantly on the importance of religious instruction for their slaves. Slaves who had had this advantage were recognized as entitled to privileges that were still denied to other slaves.[101] The consolidated slave law of 1829 contained the following provision: "All masters or owners of slaves . . . . shall . . . . endeavor to instruct their slaves in the Christian religion, and shall endeavor to fit them for baptism, and, as soon as conveniently may be, shall cause to be baptized all such slaves as they shall make sensible of the Deity and of the Christian faith." [102]

Conditions and Terms of Manumission.—To become free was the coveted goal of the slave. In order to reach this state he had to comply with rules, and to go through severe processes provided by the law; but after all, the becoming free, or gaining recognition as a freeman, depended much on the master. It was equally burdensome upon the master who saw fit to manumit a slave. In 1784 a tax of £90 was imposed on a manumission. The registers of the Colony were not burdened with records of manumissions. Such tax was not removed

[98] 10 Geo. IV, 13.
[99] 10 Geo. IV, 13.
[100] 10 Geo. IV, 13.
[101] See *e. g.* 24 Geo. III, 1.
[102] *Loc. cit.*

FIG. 1.—NEGROES COMING TO VESSEL FOR MEDICAL TREATMENT, CLARENCE HARBOR, LONG ISLAND

FIG. 2.—THREE BROTHERS AFFLICTED WITH CONGENITAL BLINDNESS, HOPETOWN, ABACO

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and declared illegal until 1827, at which time only a small registry fee was exacted of such liberally disposed masters.[103]

A law of the year 1805 confined the trial of all questions of the freedom of slaves to the General Court. For the accommodation of claimants to freedom in the Out-islands, it was arranged that a magistrate could force a master to give up his claim to the ownership of a slave, or pay the expense of carrying the case to Nassau for trial in the highest court of the Colony. The expense of the latter alternative fell upon the master. In all such trials for freedom only the freedom of the slave could be determined, and only nominal damages awarded; but if the judgment were favorable to the claimant, another suit for damages could be made, as well as for wages for the time during which freedom had been unlawfully withheld.[104] A second suit for freedom, on grounds different from those on which freedom had once been denied, or based on facts occurring subsequent to the previous judgment, could not be denied to a slave.[105] Magistrates were authorized to appoint guardians for slaves.[106]

By the later provision for the manumission, the instrument freeing the slave had to be in writing, under seal, witnessed and registered. A slave could then, for the first time, purchase his own freedom under the express law of the Bahamas. He could also purchase the freedom of his wife or child, or of a relative, on such terms as he might make with the owner in each case. The code gave its support to all such agreements, if they were reasonable. In case of a disagreement between the owner and the slave, as to the price on which they had fixed for the price of freedom, a referee was to be appointed on behalf of each party, which referee would act, together with a magistrate, to determine upon the amount of compensation due the owner. If these parties failed to come to an agreement, an umpire was appointed to make a final determination. His decision on the case the law upheld. These proceedings were not to affect the rights of judgments, or of creditors, mortgagees, or joint owners.

Children under fourteen years of age could not be manumitted without the consent of their owners. The statute of 1824 forbade the manumission of old or infirm slaves, with a view to saving the Colony the expense of the maintenance of such persons in the poor establishment. In the statute of the year

[103] 7 Geo. IV, 1.
[104] 45 Geo. III, 20, and 7 Geo. IV, 7.
[105] 10 Geo. IV, 6.
[106] *Loc. cit.*

1827 such slaves were allowed to be set free, but the master so inclined must provide for all such manumitted persons throughout the remainder of their lives.[107]

Holidays.—Sunday labor was for the first time expressly forbidden in the later codification of the slave laws of the Colony. Christmas Day and the two following days were allowed as holidays. During these days the managers of gangs of slaves, or of plantations, were strictly required to be present on their plantations, or wherever the presence of their slaves required them for the purpose of keeping order.[108]

Rights and Duties of the Masters.

Under this head will be considered: Right to property in the slave, compensation in case of manumission, as to runaways, denial of the right to cultivate land, etc., punishments, general authority over slaves.

Right to Property in the Slave.—The slave code secured to the master the possession of his slave as a chattel. The master held the slave bound to himself, had power to limit his freedom, to govern his conduct, and to determine his sphere of action, within the limits of the restrictions mentioned above. At best in this Colony, where mildness was reputed to have prevailed in the treatment of slaves, his lot was still that of the slave. With this property the master had the right of purchase and sale, which was absolute within certain bounds. He could alienate a slave just as he could alienate any other property, except when such alienation would involve a removal outside of the Bahamas. Removals were regulated by statutes of the imperial Parliament. The time and energies of the slave were at the disposal of the master. By the custom of the place, slaves were allowed some time to work for themselves, to be utilized, if they saw fit, for the laying up of money for buying absolution from their own bonds. The offspring of slaves were, by law, in the same condition as their parents, and belonged to the owners of the parents.

Compensation in Case of Manumission.—The slave code not only guaranteed to the master the possession of the slave, but if the latter was manumitted, or taken from his master without consent, compensation was allowed for the loss. In case of manumission by agreement between

[107] 4 Geo. IV, 6, and 7 Geo. IV, 7. Admiral Fleming states that he knew of a few cases in the Bahamas, in which the negroes had bought their freedom from their masters, but that, in his experience there, he did not know of many cases of that kind. Sess. P., 1831-32, 20, pp. 218-19.

[108] 10 Geo. IV, 13, sec. 75.

master and slave, the former was allowed whatever compensation might have been agreed upon. If a slave were condemned by a court to be executed or transported, the jury passing the sentence was authorized to fix a valuation on the slave, not to exceed £100, which was made over to the master from the public treasury as compensation.[109]

As to Runaways.—The runaway slave was returned to his master when apprehended.[110] It was difficult for a slave to make good his escape in a country where there was so little land on which to hide, and where the means of transportation were so limited. But running away was at times a frequent occurrence; so common did it occur several times in the history of the Colony as to become a matter of serious concern to the authorities. Both Governor and legislature might be seen at times dealing with this vexed question, offering amnesty to slaves who would deliver themselves up within a given time, and warning those who refused to surrender.[111] The alarm, caused by the great number of desertions in the years 1800-01, was the immediate cause of the passage of a law to deal summarily with them. It ordered the registration of all free negroes, mulattoes, mustees and Indians, and enacted that if at any time five or more runaway slaves were reported, free negroes were liable to be armed and sent in pursuit of them. Colored freemen were offered rewards for the arrest and delivery of deserters. They were allowed to kill a fugitive slave, if necessary, in order to ward off a counter attack from the offending slave.[112]

The later code defined a runaway as follows: "Every slave absent from his owner or employer for ten days together without leave . . . . found at a distance of eight miles from the house or plantation, to which he belongs, without a ticket, or permit, shall be deemed a runaway." Exception was

[109] 10 Geo. IV, 13.

[110] Smyth's Ds. No. 212, and Ds. S. St., 1833, No. 103. The question of runaways became complicated with that of removal under the administration of Sir James Smyth. He interfered with the removal of several slaves who had run away from the Out-islands to New Providence to escape from ill-treatment of their masters. Removals from one island to another were allowed only when the person owned land on the island to which the removal was to be made, and was removing the slave for the bona fide purpose of cultivating that land.

[111] *Bahama Gazette*, XI, Nos. 40, 55, 75, 115, 296, etc. Hardly an issue of the *Gazette* in 1794-95 failed to give notice of the escape of a fugitive. Private rewards were offered for their return. See also H. V., 1800-01, p. 21, record of the action of the House of Assembly respecting runaways. The slaves had congregated in the interior of the small island of New Providence where their presence had caused alarm to the white inhabitants.

[112] 10 Geo. IV, 13.

made for slaves going to and from market with such articles as they were allowed to trade in. According to the code the master of a runaway slave was required to advertise a description of the property thus escaped; otherwise if the slave were executed or transported for any crime the master could receive no satisfaction from the public treasury. There were standing rewards, authorized by the law, for the encouragement of the free blacks in the arrest of fugitives and in the capture or destruction of rebellious slaves. If, on the other hand, a slave assisted another slave to secure himself in hiding, or aided him in making good his escape, he made himself liable to a flogging of from forty to a hundred stripes. A free colored person, taking part in such an undertaking, became liable to a fine, or imprisonment until he consented to pay the same. The purchase or sale of runaways was forbidden under heavy penalty. A reward of £1 was offered to a freeman who should return a deserting slave.[113]

Workhouse keepers were required to advertise monthly lists of all returned runaways in their custody. Any slave, still in custody at the end of twelve months, could be sold at auction, and the proceeds devoted to the maintenance of the workhouse. The escape of slaves from the custody of the workhouse was treated with not less than fifty lashes on the bare back of the offender. Slaves, who succeeded in prolonging their stay away from the place to which they belonged for six months, were liable to punishment at the discretion of two justices of the slave court; those staying away longer than six months became liable to transportation for life, or to suffer such other punishment as the justices saw fit to inflict, not extending to life or limb.

An attempt to run away from the Colony, which inevitably involved the heinous offense of stealing a boat, was also punishable with transportation, or such penalties as the slave court saw fit to inflict. A free colored person, assisting in such an enterprise, made himself liable to transportation for life, and if he returned to the Colony, he was to suffer death without benefit of clergy.[114]

Denial of the Right to Cultivate Land, etc.—Owners or masters could deny to their slaves the right to cultivate, on their own account, cotton and certain other crops, to rake salt, or to raise cattle or any other live stock. They could not prevent slaves from cultivating peas or beans, nor even from dealing in and raising corn and cotton, when the master was not engaged in the same occupation. Slaves were allowed to go about dealing in dry goods, only on

[113] 10 Geo. IV, 13.
[114] 10 Geo. IV, 13.

certificate from the masters, which would protect them from being arrested and imprisoned. They were altogether forbidden to sell spirituous liquors, or to sell meats, either of which offenses demanded the application of the lash.[115]

Punishments.—Slave masters had the right practically to punish their slaves at their own discretion almost to any extent that discretion might allow, with impunity to themselves. They themselves reported that their punishments were light, and only such as were essential for the promotion of good deportment among the slaves. There is reason to believe that the punishments inflicted in the Bahamas were generally mild, but there were instances of the most unprovoked brutality, showing the possibilities under a regime in which the law, while expressing itself against cruelty to the bondsman, was impossible of enforcement, so that almost full rein was given to the masters. Slave masters could not be punished for ill-treatment of their slaves in a small colony, where the whole family of whites was on their side against the slaves. The grand juries left conscience behind, and did not hesitate even in the presence of a watchful governor to ignore the complaint of a slave against the cruelty of his master. Governor Sir James Smyth made the attempt in three test cases to prosecute masters for cruelty, but diligent and attentive as he was, the grand jury threw out slave evidence and slave complaints, just as if the law had not spoken at all in the matter.[116] This was a time of high excitement, but this was not the only time when such conduct was observed. Wilful mutilation was forbidden, under penalty of forfeiture of the claim upon the recipient of it. The death penalty without benefit of clergy nominally threatened the murderer of a slave. Placing iron collars on the necks, loading their bodies with weights or chains, offenses which doubtless never found many to inflict them in the Bahamas, were forbidden. The use of the whip, cat-o'-nine tails, or other instruments, to persuade slaves to work were also placed among the forbidden things.[117]

The most common form of punishment for petty offenses was whipping. This must have been inflicted at the nod of the owner in the time before the amelioration was begun. There seems to have been no restriction as to the number of lashes that could be inflicted, until the statute of 1824. At that time a limitation was fixed which was retained in the later code. No more than thirty-nine lashes were to be laid on in one day, and no further punish-

[115] 4 Geo. IV, 6, and 10 Geo. IV, 13.

[116] Cap. II, pp. 63-64.

[117] 7 Geo. IV, 1, sec. 8, and 10 Geo. IV, 13.

ment of the kind was to be inflicted until the recipient had become free from the lacerations resulting from punishments already inflicted. The owner, or the person authorizing the infliction of the penalty, was required to be present, and to witness the application of it. The British Ministry and the Governors of the Colony made attempts to have the flogging of female slaves dispensed with altogether. The nearest approach to this that was ever attained was in the provision that females above the age of twelve years could be punished only in the presence of their masters, or that flogging could be commuted to solitary confinement, or stocks, or distinctions of dresses, none of which was to continue for a longer period than ten days. This commutation was at the discretion of the master. Gaol and workhouse keepers were forbidden to punish slaves committed to their custody, without the consent of the owners or employers or of some competent court.[118]

Violence towards whites was a very grievous offense for a slave to commit. Assault on a white was punished with death, under the statute of 1784. Other abuse of a white person, under the same statute, was atoned for by a fine of £15, or corporal punishment, not limited in amount or in character.[119] In 1824 violence towards whites was made punishable at the discretion of the magistrate before whom the case was brought. The statute of 1827 fixed the penalty at fifty lashes for abusive language or threats against a white person. The death penalty for an assault against a white with a dangerous weapon was reënacted in 1830.[120]

General Authority Over Slaves.—As a privileged class in a community the whites were given certain general authority over all slaves in the Colony. They used their influence of moral suasion for the preservation of order and the prevention of trespassing on private rights by slaves. Although these duties were in the main extra-legal, there were nevertheless some such requirements expressed in the code. By the law of 1784 whites could disarm any slaves or free colored persons whom they found at large with arms in their hands. By a law of 1823 whites could authorize slaves to kill hogs, goats or sheep which trespassed against the stock laws by running at large on the highways about Nassau and its suburbs.[121]

118 10 Geo. IV, 13.
119 24 Geo. III, 1.
120 10 Geo. IV, 13.
121 3 Geo. IV, 2.

Operation of the Registration System.

During the years that the House of Assembly was resisting the efforts of the home government to secure a definition of the legal status of the slaves, the registration system was not lost sight of. It had been put into operation and several enumerations had been made.[122] The colonists never gave up the hope that the King and the Ministry would see the utter uselessness of the registration system for this Colony, and would allow it to be repealed. It was doubtless to this end that a report was made by a House committee on an inquiry into its workings in 1827.[123] This report was doubtless colored to make it appear that there was no need of the system, as it was made by those who would have liked to have found in it such objectionable features as would demand its repeal. It was a vexation to the people of this Colony where the constituent islands were so widely scattered. It entailed an expense that made it more vexatious, since it was, from the point of view of inhabitants of the Bahamas, an unnecessary system. The slave mariners, who were peculiarly useful owing to the physical condition of the Colony, could not be employed regularly, nor to the advantage of their owners. The employment of them outside of the Colony was forbidden, and use within the Colony was subjected to such restrictions as almost to deprive the owners of the value of their skill. Difficulties arose in registering the slaves of the ignorant Out-island people. But for the consideration shown them by the Registrar of slaves, in spite of the inaccuracies of their returns, the operations of the law would have been attended with much greater difficulties.[124]

THE ABOLITION OF SLAVERY.

Thus far there had been no serious difficulty in the enforcement of the new slave code. The greater part of the time had been taken up with the enactment of slave laws in such form as would be acceptable to the home government. Governor Grant had had some difficulty with the House of Assembly, but had left the Colony with amicable relations still existing between himself and the people. In 1829 Sir James Smyth was sent out as Governor.

[122] Sess. P., 1831, 19, p. 171. The total slave population of the Bahamas in 1831 was 9268. There were 2991 free blacks, and 4240 white. See also *loc cit.*, 1833, 26, 473, extracts from several censuses. In 1822 there were 10,808 slaves, in 1825 9284, and in 1828 9268.

[123] H. V., 1827, pp. 24-26.

[124] *Loc. cit.*

Governor Sir James Smyth.

The new slave code was practically completed on his assumption of the government, and with a few exceptions was in accord with what had been recommended by the British Ministry. It was now the duty of the new Executive to apply that code to the society of the Bahamas, and thus accomplish the end which had been aimed at in all the anxious endeavors of the preceding fifteen years.

Sir James Smyth was a thoroughly conscientious man, painstaking in all he undertook to do, and attentive to all the duties of his office. He was filled with the abolition sentiment of the mother country, which had been the cause of so much anxiety to the British colonists, and was a willing instrument for the enforcement of the amelioration laws. He hated the injustice of slavery and was not in sympathy with the invidious distinctions as to color and race which pervaded the Colony. He also had an exalted idea of the prerogative, but found here, however, that the legislature had taken into its hands several important functions of the Executive. A part of the task he was to undertake lay in the reclamation of legitimate executive powers from the grasp of the House of Assembly.

Attempt to Give Effect to Reforms.

The legislature was in session when the new Governor arrived at Nassau. In his closing address to that body, soon after his coming, the Governor frankly congratulated the members of the House and Council, that they had gone beyond what any of the other colonial legislatures in the West Indies had done in the enactment of provisions for the amelioration of their slaves.[125] Although so much credit was due to this body, in the view of the Governor there was still one important question which they had steadily refused to yield. This was the flogging of female slaves, on which so much emphasis had been laid as the darkest blot on the institution of slavery.[126] It was claimed by the slave owners that flogging was the sole means of compelling the submission of refractory females, that they were more difficult to deal with than the males, and that until some other mode of punishment equally as effective as flogging could be discovered, they were unwilling to give

[125] H. V., 1829, 107. This was not a source of gratification to a body of slave-holders, who were hoping that the ministry would discover the inexpediency of the enactment of such laws and instruct the Governor to apply for their repeal.

[126] 10 Geo. IV, 13.

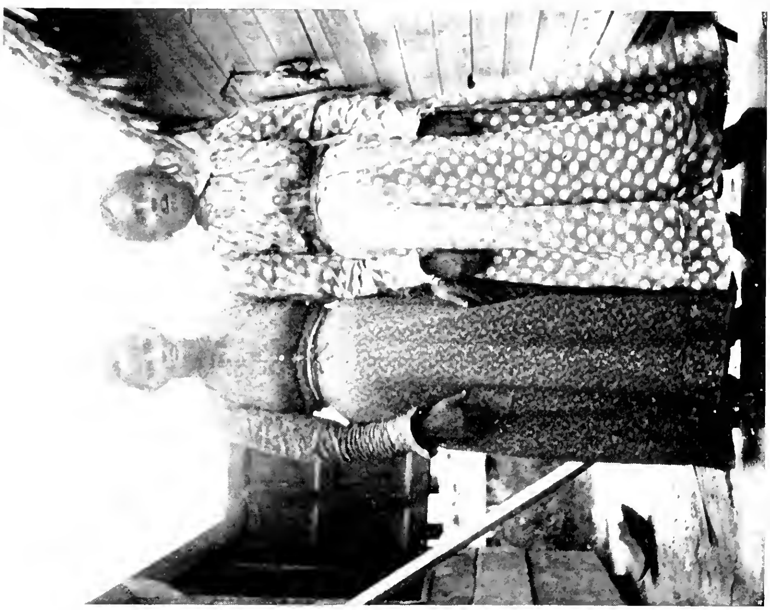


FIG. 1.—TWO IDIOTS OUT OF FIVE IN A FAMILY OF EIGHT CHILDREN, HOPETOWN, ABACO

FIG. 2.—MOTHER OF GIRLS SHOWN IN ACCOMPANYING FIGURE

VIEWS ILLUSTRATING SANITARY CONDITIONS

it up. The Governor made known his attitude against this practice in a proclamation.[127]

A case demanding the Governor's attention soon arose. One of the justices of the General Court, acting as agent for an estate, sent a female slave to the police court at Nassau, where she was ordered to be flogged. The Governor acted quickly when the case came to his attention. The Assistant Justice, who was a member of his Council, was suspended from that position, and the police magistrate, Robert Duncome, was suspended from office, both to await the determination of the home government on the conduct of the Governor.[128] The Executive, confident of the good results that would follow, was dismayed to find out that the conduct of the two prominent persons did not cause an expression of disapproval on the part of the people. It now began to dawn upon him that it was improbable that he could procure the passage of the desired law against flogging women.[129]

When the Assembly met again, in the fall of 1831, Governor Smyth made an appeal to the House to pass a law to do away with the inhuman practice of flogging. He had just restored to their owners a crew of slave mariners whom the revenue officers had attempted to condemn for a violation of the law governing removals.[130] His conduct in this affair had greatly pleased the House, for it had sent an address to him not to allow the slaves to be prosecuted. The Governor took advantage of the favor gained by his conduct, to press upon the Assembly the question of flogging of females. But he was doomed to disappointment again. The feeling on the question had not improved in the least in favor of the view of the Governor. While it was acknowledged that whipping was not often necessary, and that it was being

[127] Smyth's Ds., No. 42, and H. V., 1831, p. 95.

[128] Smyth's Ds., No. 42

[129] *Loc. cit.* The Governor was relieved from embarrassment in his Council by the resignation of Assistant Justice Lees. In this affair and in the difficulty with the slaves of Lord Rolle, Lees was estranged from the Governor, and the latter was thus unfortunately deprived of the services of a man who made himself invaluable to the successors of Sir James Smyth.

[130] H. V., 1831, p. 73. The revenue officers had seized the crew of a sloop on its arrival at Nassau for an alleged violation of the law governing removals, committed at Crooked Island. The Governor, anxious that justice should be done, laid the case before the Crown law officer for his opinion. The Solicitor upheld the seizure, and held that the slaves should be prosecuted to condemnation and forfeiture. The House sent in an address to the Governor, praying that he would not suffer the property of one of the inhabitants to be treated in this way. The Governor overruled the opinion of the Solicitor on the merits of the case, and restored the slaves to their owner.

abandoned in practice, still these representatives of the slaveholding constituencies were unwilling to give the sanction of legislative approval to its abolition.[131] In the Council there was better success. A provision for this purpose passed there, however, was thrown out on the first reading in the House.[132] An appeal was made to the clergy of the Colony to use their influence in educating the people to a more humane feeling, and to use their influence against the practice,[133] for the Governor realizing that the only way in which the abolition of female flogging could be brought to pass was by the reaction on the Assembly of the public sentiment of the community.[134]

Flogging of Female Slaves.

This meeting of the legislature had closed in the spring of 1831. Another session was found necessary in order to enact some provision for the jury law, which expired during the year. The Assembly was accordingly called to meet early in June. The Governor had purposed to be unremitting in his efforts to secure the passage of a statute abolishing the flogging of female slaves, and he availed himself of every opportunity to call the attention of the members of the House to it, and to urge them to take action for that purpose. He had prepared an address to the House on the question, and was on the point of presenting it, when information was brought to him of a bold act of cruelty to a female slave.[135] John Wildgoos, a member of the House for western New Providence, had ordered a female slave, belonging to himself, to be punished in the workhouse, where she had been confined for several weeks, following a former severe punishment, also inflicted by his order.[136] Governor Smyth merely called the attention of the House to the conduct of this member, trusted it to take the course which humanity would have dictated, by the expulsion of Wildgoos from its membership. In spite of the former disappointment at the tolerance of the community as to flogging, he still confidently expected to find sufficient humane feeling among the members of the House to

[131] H. V., 1831, p. 95. The members of the House appeared not to think it worth while to reiterate the arguments against the flogging of women. They referred the Governor to a former address of the House upon the same question.

[132] Smyth's Ds., No. 88.

[133] *Loc. cit.*

[134] See this address printed as enclosure No. 2, in Governor's Ds. of April 5, 1831. Sess. P., 1831-32, 46, p. 287 (24).

[135] H. V., 1831 (extra session), p. 36.

[136] *Loc. cit.*

rise up against such conduct as this on the part of one of their number.[137] But he had not rightly judged this body of men. He had credited them with too much anxiety for humane treatment of their slaves. This legislature like its predecessors had been so extremely sensitive to encroachment on its own assumed rights, and had insisted on privileges and immunities for its own members, but it was not inquisitive in the case of one of a down-trodden class for whose condition it was responsible. These slaveholders did not wish to have the abuses which their system of bondage would permit inquired into and revealed to the world. It was no affair of theirs. If the member had committed any breach of the laws of the Colony, the courts of law were open to punish him. As far as they were concerned, they would take no further notice of the allegations against him, than to reply to the Governor that they regarded his late message to them as an interference with their privileges which was "unwarranted and wholly unprecedented."[138] It would appear that the Governor was not acting outside of the line of his duty in calling the attention of the House to the conduct of affairs and current events in the Colony. He made no request of the House, he merely called the attention of the members to this fact that had been reported to him, with no comment thereon.[139] He did not expect the House to proceed to the punishment of the member, further than to investigate the case, and consider whether he should continue to hold his seat in the House, for he himself expected to make Wildgoos answer at the "bar of the proper tribunal" in the trial of the case.[140] He might in his own view have been charged with dereliction of duty, if he had failed to call attention to it. On the side of the House, it was an outburst of that traditional jealousy of the Colony against alleged interference with its privileges, occasioned at this time by an exasperated state of mind. This Governor had been insisting on the consideration of this question ever since his arrival in the Colony, and now the House wished him to make an end of it. Both House and Governor doubtless felt that it was improbable that Wildgoos would be made to suffer for what he had done. A public sentiment, that would not demand his expulsion from the membership of the House of Assembly, would neither demand his prosecution in the courts of justice. The Governor desired it to be established and to become known that such conduct would not be tolerated in

[137] *Loc. cit.* Governor's address to the House on this affair. Also *loc. cit.*, p. 40.

[138] H. V., 1831 (extra session), p. 38.

[139] *Loc. cit.*, p. 36. Governor's address.

[140] *Loc. cit.*, p. 40. Governor's address.

the Bahamas; the members of the House desired to ignore the matter and allow it to be advertised as little as possible.[141]

The House determined upon the recall of Sir James Smyth from the position in which he had become a cause of constant vexation to it, and to the slaveholding element in the Colony. It began with an investigation of the state of the police and the Nassau workhouse and gaol. On this committee of inquiry were placed two of the most violent slave owners in the whole Colony, one of whom was very bitter against the Governor for his conduct in the case of some runaway slaves.[142] This report charged the Governor with unjustifiable interference with the trials of slaves, in several instances, with the result that the owners had to become judges and executors of the law and to punish their slaves on their own authority. It charged him further with using his patronage for breaking up the influence of masters over their slaves; and that witnesses in the courts had been cautious in giving their testimony, fearing executive displeasure.[143] The House was so well pleased with the report of this committee that it proceeded at once to the passage of a set of resolutions denouncing the Governor, charging him with subversion of law, with encouraging a refractory spirit in the slaves, with encroachment on the privileges of the House, and continued maladministration of the affairs of the Colony until it became the part of duty no longer to submit; it openly declared its utter loss of confidence in him. It resolved to ask the King to remove him from the government.[144] The Governor had refrained from interfering with the House proceedings in order that that body might content itself by doing all in its power to secure his recall.[145] As soon as it had reached that point, it requested him to put an end to its proceedings as it would do no more business while he remained in the Colony.[146] Action was not long delayed. A prorogation oc-

[141] *Loc. cit.*, pp. 41, 44, 45, 47 and 49. Also Smyth's Ds., No. 105. Perhaps it should be stated that the Governor was as prejudiced on the one side of the slavery question as were the majority of the members of the House on the other. But it cannot be said that the former committed as great indiscretions as did the latter in these difficulties.

[142] Smyth's Ds., No. 105. See also the report of this committee in H. V., 1831 (extra session), pp. 44 and 45.

[143] H. V., *loc. cit.*

[144] H. V., 1831 (extra session), pp. 47-49 and 58. It was decided to send the whole of these proceedings to the Colonial Agent at London, and to the Marquis of Chandos, chairman of the West India body at London. These officials were to be asked to use their influence to secure the recall of the Governor.

[145] Smyth's Ds., N. 105.

[146] H. V., 1831 (extra session), p. 57.

curred on June 21, only three weeks after the opening of the session.[147] Not long afterwards a dissolution was proclaimed, and the members were sent back to their constituents " to appeal to that good sense, and to that good feeling, which have ever been found to be inherent in Englishmen in all parts of the world." [148]

In the midst of the excitement over these things, the consideration of the jury question for which the session had been called was forgotten. As no jury act was passed, there was no provision for the calling of jurymen, except by the common law, according to which colored freemen could be included in the list of those called for this duty.[149] Another advantage was that the common law did not exclude the evidence of slaves from the courts.

Governor Smyth had succeeded in effecting some reforms in the slave courts of the Colony. Before he came, the complaints of slaves had not met with any considerable encouragement. Records of the slave courts had not been kept before the year 1829, when a special instruction directing this to be done was sent out by the Secretary of State.[150] These records were now, in every case, laid before the Governor prior to the execution of the sentence imposed, and, on the authority of his superior, the Governor allowed the execution of no sentences in cases in which he had reason to extend the King's pardon to the offenders.[151] Decorum and order were introduced, and enforced, in the trials of slaves, all which was due to the solicitude of the Governor for giving equal justice to both blacks and whites. A restoration to the position of justices in the slave courts of Magistrates Duncome and Anderson, whom Governor Smyth had suspended for inflicting punishment on slaves, worked against the success of the cause in which he was laboring. Both whites and blacks accepted it as a disapproval of the conduct of the Governor, or as an indication that the home government was not interested in the trials of slaves, nor in the measures for their amelioration.[152] These two men were again dismissed before the end of the year and finally removed from the number of the justices of the slave courts. They had begun again in the same manner in which they had acted

[147] *Loc. cit.*, pp. 57 and 61.

[148] H. V., 1831 (extra session), pp. 61-62. Also Smyth's Ds., No. 105.

[149] Smyth's Ds., 135. Half of the salary of the provost marshal was paid by the Crown. The Governor now hoped that as that officer was not entirely dependent on the House he could easily be induced to summon negroes as well as whites to serve on juries.

[150] Circular Ds., 1829, and Smyth's Ds., No. 133.

[151] Smyth's Ds., No. 133, and Ds., S. St., 1831, No. 32.

[152] Smyth's Ds., No. 133.

before they were first suspended. The sanction of the home government of the removal for a second time was a virtual confirmation of the policy of the Governor in his dealing with the police magistrates.[153]

Elections of 1832.

It was necessary, for the sake of the interests of the Colony, to have another session of the Assembly, but the Governor delayed the issuance of the writs of election in order that the minds of the excited slaveholders might become more calm before legislation was again undertaken.[154] The calmer mood was not reached, however, as he had hoped it might be. All classes in the Colony looked forward anxiously to the coming election. The members of the late House did not give up their determination to contest every point with the Governor. In this they were supported by a majority of the voting population.[155] At the beginning of the last session of the Assembly a number of the more conservative members, who were men of influence in the community, had withdrawn from the House in order to avoid being present on the occurrence of such a breach with the government, as seemed to be inevitable. Only four members were left who were favorable to the Governor. Almost every vote of the session had resulted in a majority of 13 to 4 against him. The extremists now set about the returning of the same individuals to the new House. A scurrilous newspaper, edited by a disaffected individual, took issue with almost every act of the government, and became the organ of the opposition, reveling in false charges against the government and gross abuse of the colored population.[156] Local officials, the payment of whose salaries depended on the annual grant of

[153] Smyth's Ds., Nos. 122 and 124, and Ds., S. St., 1832, Nos. 44 and 45.

[154] Smyth's Ds., No. 127.

[155] See H. V., 1832; app., p. 1. Petition of the House for the removal of the Governor. Petitions were also sent in from the inhabitants of New Providence, from Harbor Island, and from Abaco, calling for the removal of the vexatious Governor. See *loc. cit.* and ff. The results of the elections to the new House will show better than these things the state of feeling of the majority of the voters of the Colony towards the policy of the representative of the Crown in the Bahama government.

[156] Smyth's Ds. of July 2, 1832, account of the prosecution of the editor of the *Argus* for libels on the Governor, abuse of the negroes, and the whites who had acted in support of the Governor and his policy. This editor was convicted on the first of the six charges brought against him. The others were withdrawn. See on the conduct of this paper, Ds., No. 127.

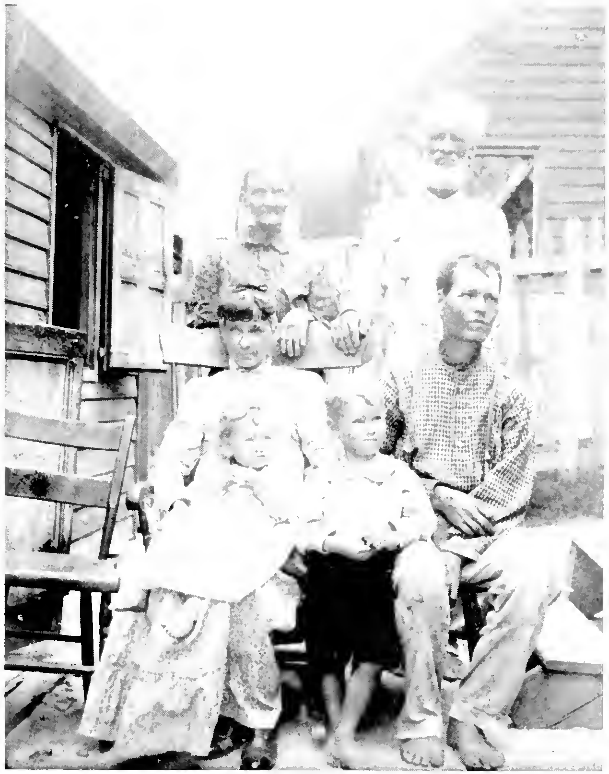


FIG. 1.—FAMILY AT HOPETOWN, ABACO. THE YOUNG MAN IS A CONGENITAL IDIOT

FIG. 2.—NEARER VIEW OF CONGENITAL IDIOT SHOWING ALSO FLACCID PARALYSIS OF LEFT ARM

VIEWS ILLUSTRATING SANITARY CONDITIONS

the House of Assembly, were neutralized in the elections that here took place.[157] The whole of the local population was not, however, against the Governor. Some of the most influential slaveholding members of the community had viewed with disapproval the course pursued by the majority of the late House, and were at this time working for the defeat of that majority. The whole of the free negro population was favorable to the government.[158] But there was not a large number of this class that were admitted to elections. In spite of the efforts put forth to elect men of temperate disposition, all seemed to point to a victory for the opposition, in which event there would be a renewal of the old difficulties and an inevitable resort to a dissolution.[159] It was a time of anxious anticipation with Governor Smyth. The elections occurred near the beginning of the new year, 1832, resulting in the return of most of the same individuals who had sat in the late House, and with an addition of others of the same disposition. The opposition majority in this Assembly was stronger than it had been in the former one.[160]

The Governor opened the session of the legislature on the seventh of February with another appeal for the removal of the legal distinctions as to race, urging that the House could surround itself with grateful friends.[161] A House committee hastily drew up a reply, on the receipt of the executive address, and presented it to the House for its sanction. It contained a refusal either to alter the laws governing the negroes, or to legislate at all while Sir James Smyth was Governor of the Bahamas. The Governor was addressed in language that was unusual on such an occasion. Messrs. Malcolm and Nesbitt, the sole government members, proposed certain

[157] *Loc. cit.*, No. 132. Some of these officials doubtless favored strongly the policy of the government but dared not take active part in the elections because of this influence of the House over them. Incumbents of these positions who were sent out from England were generally favorable to the policies of the government and were a source of strength to it in its struggles with the local legislature.

[158] *Loc. cit.*, No. 127. When the petitions for the removal of the Governor were sent in, the free blacks of New Providence petitioned the King to retain Sir James Smyth as their Governor. There was a like petition of the whites of the same island. See acknowledgment of these in Ds., S. St., 1831, No. 32. In his despatch, No. 133, the Governor wrote that many of the ignorant whites at Abaco and elsewhere signed the petitions against him, because they were under the influence of the store keepers on Bay Street at Nassau.

[159] Smyth's Ds., No. 127. While the Governor was planning for the meeting of the legislature, he was also planning the course he should follow in case of a dissolution without the passage of the necessary legislation.

[160] H. V., 1832, p. 1.

[161] H. V., 1832, p. 7, Governor's opening address.

alterations in order to make the address more respectful. All their suggestions were rejected by the vote of 19 to 2, and the address was presented as it had come from the hands of the committee.[162] The temper of this body was further shown on the presentation of a despatch from the Secretary of State, in which the full plan of the Ministry for the amelioration was outlined.[163] Those who were urging these measures little reckoned that within the next two years Parliament would take the vital step in disposing of this burdensome question; they could not foretell that the proposed regulations, if adopted, would have no more than time enough to come into full operation before the necessity for them would have passed away. The hard experience of eight years had impressed the Ministry with the necessity of firmness in dealing with the holders of slave property, and of consistency in the advice that

[162] H. V., 1832, pp. 18-19.

[163] V., 1832, pp. 25-32. Copy of the despatch of Secretary Goderich. The home government now attempted to make it known that there had never been any intention on its part to deceive the colonists, but that now it was thought well to make a full declaration of its motives and intentions which had actuated it throughout the whole course of its dealings with the slave question. It was represented that it was necessary to satisfy the feeling for the slaves in the mother country. On the other hand, that there was a strong feeling of sympathy for the holders of West Indian property, which was so much affected by these measures. It was represented that during the last eight years the efforts in behalf of the slaves had met with slight success, that advice given had been little heeded, and "in many cases rejected without the forms of respect." The following was stated as the final intention, but not in the spirit of peremptory dictation: "His Majesty's government intend to propose to Parliament in the present session, in common with other financial measures of the year 1832, a measure of substantial relief for the West Indian interests, so framed as to take effect on the produce of the Crown colonies as a matter of course; and upon that of the other colonies only in which the provisions, in their precise terms, and in their entire extent, of His Majesty's Order-in-council (of Nov. 2, 1831), for improving the condition of the slaves, shall have acquired the force of law. The measure will be so framed, that the indispensable condition of receiving the benefit of it will be the existence of a colonial statute having passed the colonial legislature simply, and without qualification in terms, or time, declaring the Order-in-council to possess the force of law in the colony." Further, it stated that allowing the legislature to frame the statute was by no means the intentions of the home government, as that left in its hands also the essence of the law. The labors of several years had secured the faithful execution of very little of the desired program. Prejudice prevented the Colony from doing what the home government demanded; dispassionate self-possession, so much needed for unbiased action, was absent. The government would be seriously concerned, if these measures failed to pass. The prosperity of the planters was to be renewed. West Indian insensibility to public opinion in the mother country was regretable in this view, for it threatened the colonies with more dangerous calamities and commercial reverses than they had ever experienced, and which it was beyond the power of human resources to prevent.

was given them.[164] The copy of the Order-in-council was laid before the House at the same time.[165] It was printed, and copies of it were distributed by the members of the House to their constituents, in order to obtain their views, before deciding a question of such momentous importance.[166] But whatever might have been the opinions of their constituencies, they repeated their declaration not to consider the question of amelioration while the head of the government remained unchanged.[167] The Council expressed its opinion that the measures were not applicable to the Bahamas.[168] The colonists feared that if the Governor were allowed to continue his course a slave insurrection would follow. Again they recited their grievances in a petition to the King for the recall of Governor Smyth.[169] The House proceeded to business, passing bills "for the public benefit," some of which were so framed as to make sure that the Governor would not give his assent to them. Thus the responsibility for the lack of legislation would be shifted to the Executive. Payments were authorized by the House to be made without the warrant of the Governor.[170] Other measures offered by the House would have perpetuated the legal recognition of the race distinction; a market bill provided that no negro should be a member of the market commission; a printing bill contained within itself the names of all the commissioners, all of whom were members of the House of Assembly; the revenue and appropriations bills contained very objectionable provisions. Three or four important bills that were presented were left unsigned by the Governor.[171] When the violent course of the House led it again to the point of petitioning for the recall of the Governor another dissolution was resorted to, in order to prevent more violent conduct.[172]

[164] *Loc. cit.*, pp. 25-32.

[165] *Loc. cit.*, pp. 33-72.

[166] *Loc. cit.*, p. 110.

[167] *Loc. cit.*, p. 121.

[168] Smyth's Ds., No. 141. All but two of the members of the Council were at the mercy of the House on the salary list question. The Governor hoped to gain control of the salary list, and thus secure independent action on the part of the official members of the Council.

[169] H. V., 1832, p. 209. The petition was dated March 21.

[170] Smyth's Ds., No. 142.

[171] *Loc. cit.*, No. 143. The Governor had forewarned the House that he would not sign any bills that were such as would tend to perpetuate the invidious race distinctions.

[172] H. V., 1832, p. 232. This was the second dissolution within a period of eight months.

Governor Smyth and the Slaveholders.

This was the end of the struggle between Governor Smyth and the House of Assembly. With the consent of the Secretary of State, the Governor determined to undertake the government of the Colony for a term without the assistance of the legislative body, hoping thus to introduce a better state of feeling among the people. Before the time when the next House was called Sir James Smyth had been removed from the Bahamas.

The excitement which had prevailed among the inhabitants of the Colony had only been increased by this second dissolution of the Assembly.[173] The persistence of the House in its opposition to the wishes of the home government, and its heedlessness to the warnings of the latter, had, in the view of the Governor, caused it a considerable loss of prestige. On the other hand, the consistent attitude of the Executive towards the question of race distinctions, and his maintenance of the rights of the prerogative, had very materially increased his personal influence in the Colony and had won back to the Crown representative the exercise of important executive functions.[174] The control of the markets and the public buildings had now come into the hands of the Executive, and he had gained a temporary control of the civil list.[175] As a result of the contest the Colony was left without the regular annual provision for the revenues. But the Governor was not thus entirely deprived of the means of supplying the needs of the public service. There were still some funds at his disposal.[176] While these would not supply all the demands on the public purse, they did relieve the Governor of the fear of not being able to carry on the government. Public and private interests would have to suffer great inconvenience in this state of things,[177] unless succor came to some of them from the

[173] Smyth's Ds., No. 143.

[174] *Loc. cit.*, Nos. 143 and 163.

[175] *Loc. cit.*, No. 143.

[176] H. V., 1832, 214. The funds that would be forthcoming, in the absence of the annual revenue act, were salt and tonnage duties, and duties imposed by acts of Parliament and collected by the King's revenue officers at the ports of the Colony. An old act of the Assembly of the 8th of Geo. II, came into operation in such default of revenue as this. It provided for revenues of which the Crown could dictate the disposal. It had been forgotten in the years 1793-4, when the Earl of Dunmore had difficulties with the House; the Receiver-General had unearthed this statute and duties were collected under its authority. It had never been repealed, perhaps owing to the negligence of the House in not removing this possibility of obtaining revenue from the Governor. Ds., S. St., 1832, No. 65. In addition to this there were the funds arising from the quit rents which came to the Crown.

[177] Smyth's Ds., No. 143.

home government, for which the Governor made application to the Colonial Department.

The Governor was left in complete control of the situation. The Assembly, being out of the way for the time being, there were sufficient revenues in his grasp to carry on the government without the interference of those who had supported the late House,[178] and he received the approval from the Secretary of State for that conduct which had excited such protests on the part of many of the colonists.[179] Further than this he was informed that the petitions, which had been sent in, calling so urgently for his removal from the government of the Bahamas, had been laid before the Privy Council, and that that body had not considered them of sufficient weight to merit any serious attention.[180] The state of feeling in the Colony was still much the same as it had been. The same prejudices existed, and there was the same aversion to the head of the government that there had been since that official had had his first break with the legislature. The seal of approval of his past conduct was an encouragement to him to continue his efforts in the "out-door" sphere, in which he had been so successful. He fully realized now that the task of relieving the negro population from the burdens under which they had been placed, and the raising of them to a higher plane, was anything but a popular undertaking in this atmosphere of slavery. He also realized that the whites alone were qualified to deal with the problems of local legislation, but that they needed to be taught the reality of the royal power, and that they should pay due respect to it. In order to accomplish his purpose the Governor feared it would be necessary to lay open wider the wounds of the Colony, and to estrange the people perhaps more than ever before, but he was confident that, with the support of the royal power, as he had been upheld thus far, there would be a speedy improvement in the state of feeling throughout the Colony. He continued his course as he had done before. During the remainder of his incumbency of the government he was not to be interfered with by the encroachments of the legislative power, upon what belonged to the Executive,[181] nor with its protest against the proper performance of his duties. We shall see how completely he had things under his control, and in what respects the local authorities were enabled to obstruct his attempted reforms.

[178] *Loc. cit.*
[179] Ds., S. St., 1832, No. 65.
[180] *Loc. cit.*, No. 73.
[181] Smyth's Ds., No. 163.

The Governor's Council.

In entering upon his new experiment the Governor had the support of the majority of his Council. Although he was successful from the very beginning, there were petty annoyances that constantly disturbed him, and tended to keep alive the animosities against the authorities. The House of Assembly in its late session had provided, before its dismission, that, in case its life were brought to a premature end, its commissioners of correspondence should keep up their communication with the Colonial Agent in London. A stream of complaints was kept going to the mother country; something was being done to disquiet the people and keep up the state of ill-feeling.[182] But the people were disappointed that the Governor was enabled to continue the government without the necessity of the voting of funds by the legislature. The ordinary functions of the government were performed regularly and punctually; salaries were paid as they had been at other times. The disappointment at his progress found lodgment in the hearts of some members of his Council. The venerable Chief Justice of the Bahamas, William Vesey Munnings, and three other members of this confidential body, could not cheerfully contemplate this successful administration. Necessary actions of the Council were "caviled at," petty obstructions were thrown in its way to impede it. Outside of the Council, the Chief Justice was in a position to defeat the ends of the government by the interpretation of the laws.[183] With his companion obstructionists in the Council he gave out a statement in public that the arrangements, suggested in the Order-in-council of November 2, 1831, were impossible of application in the Bahamas. A statement under his authority was respected, and this one would have the influence of turning men against the measures for the amelioration of the slaves. He attempted to induce the Governor to issue

[182] Smyth's Ds., No. 143.

[183] Smyth's Ds., No. 194. The Governor had desired the removal of Chief Justice Munnings from the Colony, in order that some one might be put in the position of Chief Justice who was not accustomed to interpret the laws to the prejudice of the slave, and in favor of the white man. From his long continuance at the post, Munnings was not the man to aid in the introduction of a new system in the Colony. The Secretary of State had at first considered favorably the plan for the transference of the Chief Justice to a place outside of the Bahamas. Later, however, he advised the Governor that he was unable to make the promotion. The great disappointment of Mr. Munnings at this intelligence doubtless contributed largely to determine his conduct at this time. Smyth's Ds., No. 194.

warrants for payments from the colonial treasury in an illegal manner.[184] The Governor feared a coalition of the disaffected members for the purpose of outvoting him. In order to prevent this, he seized the opportunity in the absence of two of the members from New Providence, and the inability of one other to attend, to call to the Council the Solicitor-General, the Receiver-General and the Collector of the King's customs, all of whom were of the government party.[185] The two disaffected members remaining were chagrined at the next meeting to find that they were outvoted. They gave vent to their feelings of disappointment in such rough manners and intemperate language that they were both dismissed.[186] By such measures the Governor disposed of the remnants of opposition that were left in positions of authority. At a meeting of the Council in the last quarter of 1832 he disclosed that the Colony was able to pay all salaries—judicial, ecclesiastical, and civil—in full. No hindrance to the course of public business occurring, the public confidence in the measures of the government appeared to increase. The Governor purposed to put off as long as possible the calling of a new legislature, in order that the public mind might be given time to regain composure.[187]

Attempt to Educate the Africans.

In the meantime, the Governor was making anxious endeavors to educate some of the negroes. The colonists had regarded his activities in this sphere with jealousy. The expense of what had been undertaken in this way had fallen on the Crown funds, with the sanction of the Colonial Department. Governor Smyth had desired to have placed at his disposal a quantity of school supplies, that were in the hands of the board of education, in order that he might use them in the African schools, which he had established. As Chancellor of the Colony he forced the board to give up the supplies, but he received from its members a discourteous note. He placed all of them in prison. All

[184] Smyth's Ds., No. 194. The Chief Justice in a meeting of the Council remarked that it was useless to have the Council sign the warrants for the quarterly payments from the treasury, as its consent was not necessary. The Governor merely replied that he was doing it that way because he had been instructed to do so. The legal method was for warrants to be signed in the presence of the Council. *Loc. cit.*

[185] Smyth's Ds., No. 200. He at once applied to the home government for a ratification of his conduct.

[186] *Loc. cit.*

[187] *Loc. cit.*, No. 206. This was the third quarter for which the Governor-in-Council had been able to provide support to public interests.

but two obstinately refused to make the apologies required of them. The other five had to submit to the indignity of remaining in prison for a few days. The effect of this was to increase the influence of the Executive and the public confidence in his impartiality to all classes.[188]

The Out-Islands.

Although the Governor could send back an Assembly to its constituency, still he could not by this means control slave masters in all their dealings with their slaves. The people did not consider themselves subject to all the restraints which the Governor had attempted to enforce in their relations with their slave property. In the Out-islands the prestige of the reforms that had been effected in part at Nassau was not great. In these places the Magistrates were of the same class as the ignorant mass of the people. From such administrators of the law, justice could hardly have been expected, especially towards a class of persons whom they held as chattels. The consolidated slave law was so loosely constructed, and speciously worded, that it could easily be interpreted and applied to the prejudice of the slave class. The giving of slave testimony had become a deterrent to the infliction of wanton punishments of slaves, and yet the section of the slave code applying to testimony was the most complicated portion of the statute.[189] The possibility of abuses on the Out-islands was so great that Governor Smyth resolved, on his own authority, not to allow the removal of slaves from New Providence to any of the Out-islands, unless the names of all slaves thus removed should be entered in his office as qualified and competent to give evidence in the courts.[190] At Governors Harbor, Eleuthera, it was reported that several masters had not allowed to their slaves the requisite legal amount of food and clothing.[191] Cases of cruelty occurred in some places. In several instances when masters attempted to exercise authority over slaves, or to inflict punishment on them, the latter ran away to Nassau, where they knew they could claim the protection of the Governor.[192] It has been stated

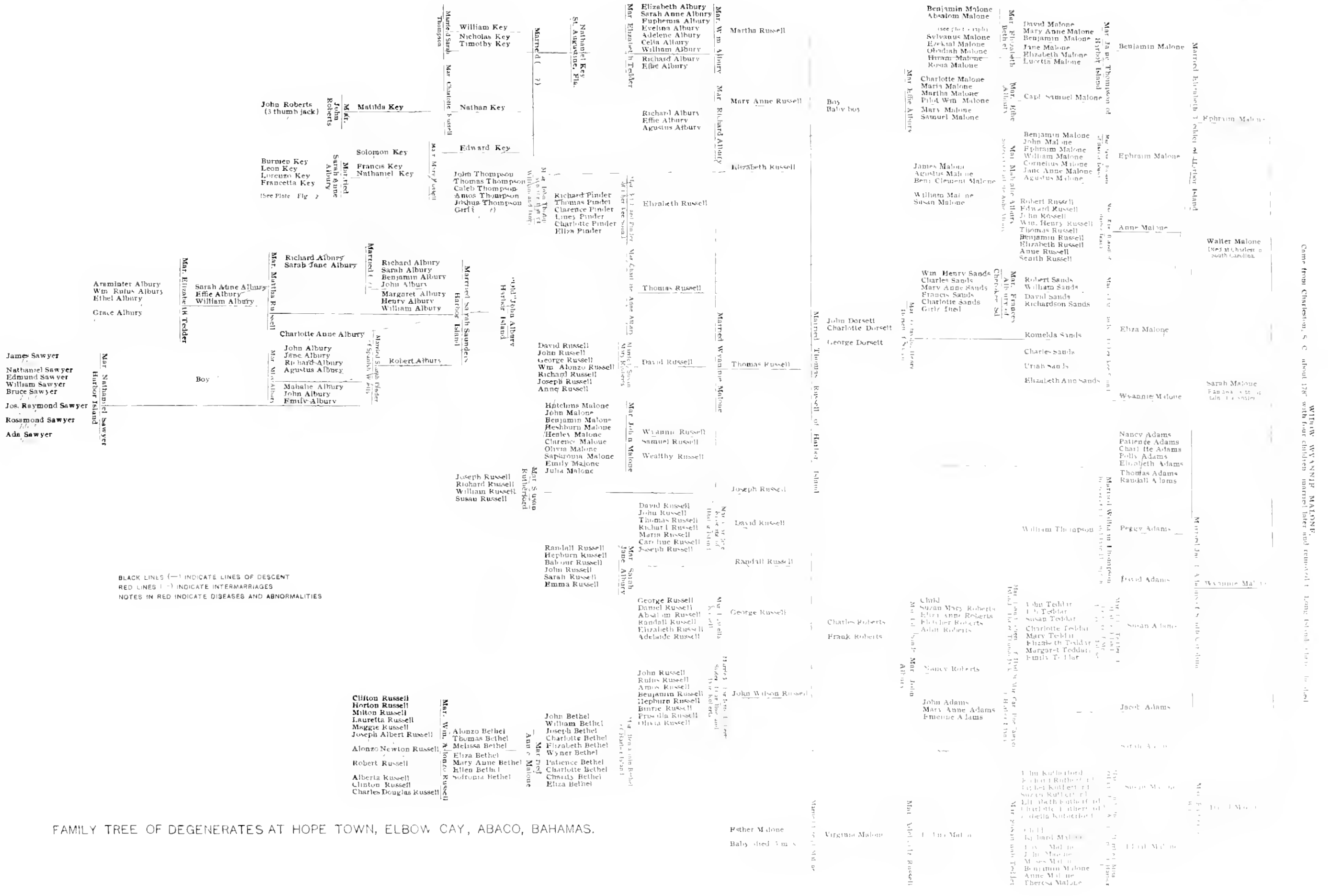
[188] Smyth's Ds., No. 203. It is interesting to note in connection with this affair that the Secretary of State not only refused to ratify the conduct of the Governor, but that he also replied that he had no power to interfere with, or take cognizance of, the exercise of the Governor's powers as Chancellor of the Colony. He declined even to express an opinion on it. Ds., S. St., 1832, No. 114.

[189] Smyth's Ds., No. 212. Also 10 Geo. IV, 13.

[190] Smyth's Ds., No. 212.

[191] *Loc. cit.* Also Balfour to Stanley, No. 27.

[192] Smyth's Ds., Nos. 63, 64, 187, 189 and 216.



FAMILY TREE OF DEGENERATES AT HOPE TOWN, ELBOW CAY, ABACO, BAHAMAS.

above that the treatment of slaves in the Bahamas was mild. If that is true still there were cases of the most unwarranted cruelty on the part of masters, and of illegal punishments, inflicted in an illegal manner. But the statement that the slavery of the Bahamas was a mild form of that institution must be taken as a relative statement, and to substantiate it, the number of instances of cruelty there occurring, relatively to the number of slaves in the Colony, must be compared with like returns from other colonies, or from the neighboring States in the same time. As compared with the slavery of the States, it may be said that the people of the Bahamas on several occasions deprecated the introduction of slaves from the continent, for the reason that they feared that the latter were so discontented, that they would be mutinous, owing to the extremely severe treatment which it was presumed slaves always received in the States. The same was true to a large extent in the case of slaves from all of the island colonies, especially from San Domingo and the French colonies. But, on the other hand, it is very easy to argue that the number of cases of cruelty in this Colony would not have to be very large in order to make the percentage high, for the slaves of the Bahamas numbered only 9000 to 10,000. However this may be, the Bahamas were by no means free from cases of cruelty, and Sir James Smyth was ever unremitting in his efforts to do away with it altogether. He found the state of public opinion disappointingly low, according to the standards of morality and social consideration to which he had been accustomed. He set to work to try to educate the public mind to a higher plane, but he did not wait until this was accomplished before trying to shield the negroes from occasional barbarous treatment. It was part of his plan to teach by example, as well as by precept, and to place before the Bahama public examples of justice tempered with mercy.

Law Against Cruelty to Slaves not Enforced.

In entering upon this line of conduct, Governor Smyth was making a break with the precedence of a system that was perhaps as old as the Colony itself. He was breaking with the interpretation, and with the application, of the law that had grown up within the Colony. The Governor determined to prevent further evasion of the slave laws. He was advised by the law officers of the Crown at London that he could proceed against a slave master charged with cruelty on ex-officio information. He then ordered the Attorney-General to bring before the grand jury the three worst cases of alleged cruelty, that he would have to take up by indictment, and through them to make a test of

the enforcement of the law against the cruel treatment of the slaves.[193] In spite of the fact that the grand jury, chosen to prefer indictments in these cases, was the fairest one that had been summoned in the Colony for several years, the several bills were ignored; so nearly was slave evidence, and the complaints of slaves, excluded from the Bahama courts.[194]

Masters continued to take advantage of the authority they had over slaves, to inflict punishment on them up to the time of the abolition of slavery. It is possible that there were more cases of this sort of conduct after the coming of Sir James Smyth as Governor than before. Their slaves may have been less disposed to compliance with the master's orders, when they knew that there was a high authority to whom they could complain with the certainty of being heard. The masters may also have been more irritable, and more disposed to inflict punishments, and to enforce subordination, for the same reason. In August, 1833, three magistrates brought to justice an offender, for cruelty to a female slave at Harbor Island. Their conduct caused such a commotion in that place, that the magistrates were compelled to swear in special constables in order to keep the peace. Four out of twelve of these were free negroes. The excited

[193] Smyth's Ds., No. 202 and 212. Also Ds., S. St., 1831, No. 37. The case of John Wildgoos was one which the Secretary of State deemed it desirable to prosecute. Wildgoos had, however, left the Colony with other rabid slave men like himself, declaring that no man could live under "the present arbitrary Government of this Colony." Ds., No. 202. Wildgoos went to America. The three cases selected for this test were: (1) That of a number of slaves from Eleuthera, who had run away to Nassau to complain to the Governor of the severity of the punishment inflicted on them. They had been taken back to their master, severely whipped again, and on their way to Nassau, making a second attempt to escape, their boat capsized, and the whole company was drowned (Smyth's Ds., No. 187); (2) The case of a female slave at Harbor Island, who had been beaten "by her master with a cow-skin about the back, shoulders, bosom and face. In this case a brother slaveholder, who was a magistrate, interfered to denounce the conduct of the master, the first instance of the kind that had come to the knowledge of the Governor; (3) "The third," writes the Governor, "was that of a wretched worn-out old man, who having served his master all his better days, was sent adrift to seek a new owner, carrying a paper saying that he was to be sold for $25." The Governor himself found him and referred his case to the police court. Soon afterwards he found the same negro "bleeding from the effects of a flogging which his master had caused to be inflicted upon him for having complained to me (the Governor) the day before." (Ds., No. 202, dated Jan. 1, 1833.)

[194] Smyth's Ds., No. 212. For other cases of cruelty see *loc. cit.*, Nos. 63, 64, 139, 187, 212, 216; Balfour to Rice, Nos. 32 and 41. Also Sess. P., 1831-32, 46, p. 287 (24), enclosures in a despatch of Sir James Smyth; letter to a member of the House of Assembly at Nassau on the flogging of women. Also H. V., 1833, pp. 105-106. Also Ds., S. St., 1833, No. 27, and 1827, No. 1 (May 12, 1827), and enclosures. Also *Nassau Gazette* of Feb. 17, 1827, Feb. 24, 1827; and Ds., S. St., 1827, No. 2, of Sept. 28.

feelings against the magistrates rose higher, and the three magistrates were on the point of resigning their commissions. Lieutenant-Governor Balfour secured from the Colonial Department approval for this conduct, as in line with the policy which it was desirable to follow in the slave colonies.[195] On other Out-islands occurred instances of mutinous conduct on the part of slaves, owing to the negligence of their masters, or overseers, in providing them with the requisite rations and clothes. At Exuma and Eleuthera gangs of slaves refused to work for this reason, but no serious consequences resulted.[196] If these cases occurred at this time, when it was known that there was a Chief Magistrate in the Colony, who was intent on punishing offenders against justice to the slaves, it is not unlikely that such a state of things existed during the years before his coming. Although these cases may not have been of frequent occurrence, still it is evident that the slave system of this Colony admitted of flagrant abuses from ill-tempered or harsh masters, and that there were here men who would take advantage of the opportunity, left open to them, to treat human beings with lack of consideration, and with unmistakable cruelty. The attitude of the public mind towards Governor Smyth gives strong evidence of the tolerance of public sentiment in the Bahamas towards the slave owner who chose to leave conscience behind in dealing with his slaves. It must have been as tolerant before Sir James Smyth came as it was afterwards. Indeed, if we accept the testimony of the slaveholders themselves, when they said that the barbarous practices, inveighed against by this Governor, were rapidly being discontinued by the force of public sentiment,[197] we must conclude that conditions were better in this respect than they had been formerly. However few, or many, the cases of this kind of treatment may have been, it is safe to say, that, in the case of John Wildgoos, the members of the House of Assembly, who may be taken to represent fairly the public opinion, were not willing to investigate the abusive conduct of a fellow member, and to put the account of

[195] H. V., 1833, pp. 105-106. Balfour to Stanley, No. 32. For the approval see Ds., S. St., 1833, No. 27.

[196] Balfour to Stanley, No. 41. The Lieutenant-Governor sent a squad of soldiers to Eleuthera to quiet the disorder. At Exuma, however, the difficulty among Lord Rolle's slaves was caused by the failure of the "literate manager" to allow to "illiterate slaves" what was due them. On that ground the government declined to interfere.

An instance of the most revolting cruelty occurred at Watlings Island in July 1833. A slave was tied hands and feet to a beam, another slave was placed across the suspended body, and, while in that posture, a merciless flogging was administered. Death resulted from the cruelty. *Loc. cit.*, No. 23.

[197] H. V., 1831, p. 95.

it on paper, so that it might become generally known. This would doubtless apply to other cases also, which occurred with their consent, or at least without any expression of disapprobation.

Removing Slaves from One Island to Another.

The removal of slaves from one island within the Colony to another was a source of vexation to the colonists, and a thing that caused no little unpleasantness in their relations with the Governor. The removal of slaves from one British colony to another was regulated by statute of the imperial Parliament. By the same authority removals from one island in the Bahamas to another were made only by special permission in each case. The licenses for this purpose were issued by the Governor, but only on condition that the owner of the slaves to be removed held lands in the island to which the removal was to be made, and was taking them thither for the bona fide purpose of cultivating such lands.[198] The result, as in the case of the registration of slaves, was a great inconvenience to the planters, who had to bear the expense of a trip to Nassau, and a loss of time, in order to transfer a gang of slaves from a plantation on one island to one on another. The worn-out condition of the soils of the Bahamas, the consequent decrease in their productiveness, and the augmented hardship on owners of supporting slaves, whom they could not employ fully, increased the feeling of the people against the vexing regulations which Parliament had imposed upon them.[199] There was often great diversity of employment of slaves in the same gang in this Colony, and the interests of the same master often required removals back and forth from island to island during each year.[200]

The people were not disposed to comply with the law on this matter.

[198] Smyth's Ds., No. 63; also No. 216. The Governor gave a mistaken interpretation to the law respecting removals, in his zeal to protect the slaves from injustice. He held that an owner could remove a slave from one island to another, only when he held lands in both islands, the one from which, and the one to which, the removal was to be made. He refused to grant licenses to those who could not certify that they held possessions according to his interpretation. During the incumbency of his successor, Lieutenant-Governor Balfour, Lord Stanley corrected the error by his instruction that the ownership of lands on the island, to which the removal was to be made, was sufficient warrant for granting a license for a removal.

For Secretary Goderich's opinion on the law, see Ds., S. St., 1831, No. 103. The imperial regulation is found in Imp. Stats., 5 Geo. IV, 113.

[199] H. V., 1828, pp. 27-28. Petition asking that the Bahama slaveholders be allowed to remove their slaves to some other colony where they could be profitably employed.

[200] H. V., 1828, p. 79. Also pp. 67 and 73.

The conduct of a prominent local official, Assistant Justice Lees of the General Court, was no encouragement to others to abide by the law. He tricked the Governor into granting a license, in an irregular manner, for the removal of a gang of slaves from Exuma to Cat Island. When the slaves were about to be removed they fled to Nassau to complain to the Governor. Lees took possession of them, brought them to trial, and threw them into the workhouse, where they were severely flogged as runaways.[201]

These regulations interfered with the use of slave mariners, many of whom were employed in the shipping of the Colony. Formerly a master could go to sea with his slaves at his own convenience, without any reference to the authorities in the government. The necessity of going to Nassau, in order to obtain a permission for each trip, in great measure deprived the masters of the value of these slaves.[202] Unless such slaves had been registered, before setting out from one island or port for another, they were liable to seizure on arrival at a port, to which the customs establishment had extended. They could then be prosecuted, as slaves brought into the island without the warrant of the Governor, the penalty of which was forfeiture.[203] The legislature protested against this regulation in the winter of 1831-1832 on the arrest of five mariners, who had been seized under it. Their protest produced no effect on those who were responsible for the regulation, although the Governor did, in the case referred to, restore the slaves to their owner.[204]

[201] Smyth's Ds., Nos. 63 and 64. Both the Governor and Lees were at fault in this affair. The former had not required the latter, as agent for Lord Rolle, to obtain the license from the Public Secretary in the regular way. The latter did not tell the whole truth as to the purpose of the removal until after the signature of the Governor had been secured to the paper bearing the license. The Governor protested against it, but to no purpose. As an officer of the law the Assistant Justice might have been more careful to comply with the letter of the law, which he certainly understood, as an example to the community. (Ds., S. St., 1831, No. 5.) Lees seemed to have had a private understanding that if he obtained the license for the removal, he would receive a portion of the profits of the cultivation of the land of another man than Lord Rolle. (Smyth's Ds., No. 63.) Another feature of this affair was that no record of the trial of the slaves at Nassau was kept.

[202] See H. V., 1831, p. 73.

[203] *Loc. cit.*

[204] H. V., 1831, p. 73. See also *loc. cit.*, appendix. The vessel, which was thus taken possession of, was on a wrecking tour. It had put into Crooked Island, where there was a collector of the port, who had never made known the fact of his presence. There had been no separate notice given out that this regulation would apply to the mariner slaves. The Crown law officer took the view that the slaves should be forfeited according to the provisions of the law. The Governor decided, and acted, on the merits of the case, and restored them to their owners. *Loc. cit.*, 1831, p. 95.

Slave Trade Survives.

Daring adventurers kept up the slave trade. Even in the face of the diligent endeavors of the British Empire to apply its laws against the traffic, the promise of gain by the smuggling of slaves into the colonies tempted many to engage in this inhuman business. The islands of the Bahamas with their numerous jutting rocks, and treacherous surrounding seas, lay in the track commonly followed by slavers on their way to certain parts of the slave territory. Navigation through these seas was always attended with great danger and wrecks were frequent. Slave ships were not exempt from these perils. Besides, the vessels of the royal navy patrolled the waters for the apprehension of slavers. Both wreckers and men-of-war continued to bring slavers into the port of Nassau, until long after the abolition of slavery in the British colonies. This was the origin of a numerous class of people in the Bahamas who became objects of special care to the Executive, and often of jealousy to the owners of slave property. Naval officers were eager to make such captures, in order to gain the rewards offered for them by the home government. Customs officers were no less eager, on account of the fees that accrued to them on the condemnation of a cargo of captives.[205]

The law regarded those landed on the coasts of British territory as freemen by virtue of their having come to that territory,[206] and the Governor assumed the role of guardian of their interests. Some of them were placed in close settlements at different places in the Colony. One cargo of them was placed at Highburn Cay, 34 miles from Nassau.[207] This settlement was to suffer great hardships. The captives were of different tribes of Africans, speaking different languages. None of them had acquired any facility in the use of English, and there was no means of communication between them. It was soon found that the best plan for civilizing them was by placing them where they would come most into contact with the whites, where they could acquire the tongue of the Bahama Englishmen, and learn also to care for themselves. The drouth of 1833 bore with especial hardship on those settled on small islands. The Highburn Cay settlers were removed to Nassau.[208] Some of the able-bodied men among them were enlisted in the second West Indian regiment, but most of

[205] Ds., S. St., 1832, No. 71.

[206] Smyth's Ds., No. 130, and No. 137, in which there is another reference to the legal opinion on this.

[207] Smyth's Ds., No. 183.

[208] Balfour to Stanley, Nos. 16 and 26.

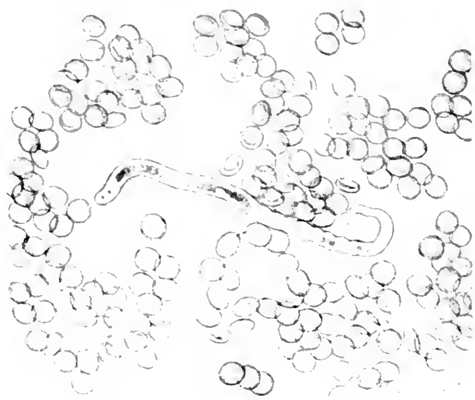


FIG. 1.—FILARIA NOCTURNA IN HUMAN BLOOD (MAGNIFIED 490 DIAMETERS)

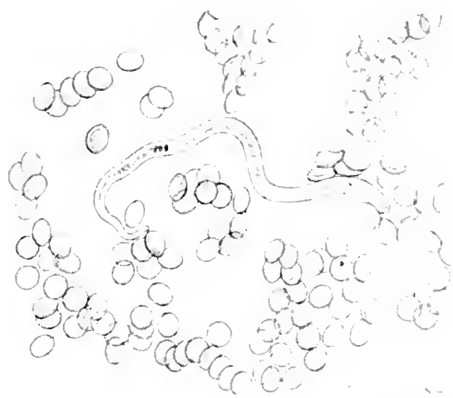


FIG. 2.—FILARIA NOCTURNA IN HUMAN BLOOD (MAGNIFIED 490 DIAMETERS)

VIEWS ILLUSTRATING SANITARY CONDITIONS

the others were apprenticed out, for terms of seven years, to the inhabitants.[209] Both of these methods of employing them were afterwards followed. As other cargoes were brought to Nassau, settlements were formed in places where the negroes could be under the care of the Governor. At Headquarters (the site of the present Grants Town), near the city of Nassau, at Carmichael, a few miles away, and at Adelaide, on the southwestern coast of New Providence Island, were founded the principal settlements of these new inhabitants of the Colony.[210] In these various places the Africans built their cabins and took up residences. The Executive gave them every attention. For those at Carmichael Governor Smyth advanced money from his private purse for their benefit, and labored in every way to minister to them and to relieve their hardships.[211] The legislature refused to aid the Governor in his enterprise. There was a jealousy of his activities in this direction, and he was looked on as a sort of "niggers' man."[212] The Bishop of Jamaica provided a small sum to aid in educating them,[213] and further sums were provided by the home government.[214] Their material needs were cared for, rations were served to them from the commissariat,[215] and, what was considered by the Governor as most important, means were provided by which moral and religious education was to be placed within their reach.[216] They were set to work on public improvements for the general good, on roads and wells at Carmichael, and on the construction of a salt pond at Adelaide.[217] Superintendents were placed in these settlements to act under the direction of the government in carrying out measures calculated to benefit the negroes. From the first it was the opinion of the Executive that they would be able to cope with their circumstances, and to maintain themselves.

[209] Balfour to Stanley, No. 26.

[210] Smyth's Ds., No. 183. Governor Smyth stated that in September, 1832, there were 514 of these negroes at Carmichael, 134 at Adelaide, and 370 at Highburn Cay. The service of the army medical staff was extended to these negroes in 1830 by a circular despatch from London. See Ds., No. 197, on the number condemned.

[211] Smyth's Ds., No. 137.

[212] *Loc. cit.*, Ds., Nos. 72 and 137.

[213] *Loc. cit.*, No. 31.

[214] Ds., S. St., 1831, No. 13. In his Ds., No. 72, Governor Smyth had asked the Lords of the Treasury for £650 for this purpose. The Lords acceded to this proposal.

[215] Balfour to Stanley, No. 16.

[216] Smyth's Ds., No. 72.

[217] Balfour to Stanley, No. 26. Lieutenant-Governor Balfour feared that it was likely that the salt pond would not benefit them greatly, after the oversight of a white man was withdrawn.

They were placed on vacant tracts of Crown land in each case.[218] The people expressed fears that their presence would bring disorders on the community,[219] but on every occasion they appeared to be orderly and disposed to work.[220]

Court Martial of Major Nicolls.

Sir James Smyth continued in the government of the Bahamas until the spring of 1833, at which time he was succeeded by Blaney T. Balfour as Lieutenant-Governor. The new Executive was of the same mind as Governor Smyth had been, on the question of slavery, although not as obtrusive as the latter in his manner. Sir James Smyth's leavetaking had been delayed by a court-martial of an officer of the troops stationed at Nassau. In the autumn of 1831 Major Nicolls became meddlesome in criticising the government of Sir James Smyth. His conduct was so flagrant that he was placed under arrest, and permission obtained from the Horse Guards to proceed against him by a court-martial, in order that the whole matter might be probed to the bottom, the insolence of the officer punished, and the government vindicated.[221] The application for the court-martial was allowed to lie at the Horse Guards unanswered for sixteen months. Meantime the offender was confined in the prison. He had not been identified with the opposition party at Nassau, but the attempt to prosecute him, as one who had criticised the government, was sufficient to arouse public sympathy for him. As the departure of Sir James Smyth was known to be approaching, the urgency of the matter was the greater, for the Governor was the sole prosecutor. If he had departed without having tried the case the trial would never have occurred, and it would have been looked upon as a discomfiture of the hated Governor. Exultation over it would have caused unpleasantness to the successor of Governor Smyth.[222] On the arrival of Balfour the trial was the theme of almost every conversation. "Every feeling of civil or military society was evidently enlisted on the one side or the other." The testimony all in hand Sir James Smyth departed, and Balfour assumed the government, while the case was awaiting the decision of the military court.[223] Balfour thought to remove Major Nicolls, in order that,

[218] Smyth's Ds., No. 72. The Governor wrote that the people of Nassau were expressly opposed to the settlement at Headquarters. At first the people steadily refused to aid them.

[219] *Loc. cit.*, No. 137.

[220] *Loc. cit.*, No. 137; also Balfour to Stanley, No. 26.

[221] Balfour to Stanley, No. 2.

[222] *Loc. cit.*

[223] *Loc. cit.*, No. 31.

having both principals out of the way, the excitement might subside. Partisans could thus be reconciled before feeling would rise against the new Executive.[224] The whole difficulty was adjusted during the following winter, when the officer appeared to make apologies for writing the letter which had stirred up so much trouble.[225]

Abolition of Slavery by Parliament.

The progress of the anti-slavery movement in the mother country was rapid. The pressure of public opinion on the Ministry for the amelioration of the condition of the slaves had kept the question constantly before the public. The colonies resisted throughout, and resented the pressure put on them to enact what they thought no authority had the right to urge. Slowly as the Bahamas yielded to the persistent persuasion of the British Cabinet and granted rights to the slaves, this Colony was among the first of the legislative colonies to take this action.[226] That which was most objectionable in the slave system, to the Englishmen in England, namely, the flogging of women, had been abolished in but few of the colonies.[227] The unwillingness of the legislature to move, and the consequent delays in the passing of the much desired statutes for amelioration, caused the demands of the English public to rise higher and to become more importunate than they had been. "The growth and power of public opinion in England," said Lieutenant-Governor Balfour to the House of Assembly, "and not ministerial voluntary option, imposed the necessity of Parliamentary legislation on this greatest of colonial questions. . . . . . Investigations in the Lords and Commons, no less than the intolerance towards the sectarian missionaries in Jamaica, hastened matters . . . . . Public feeling rose to an uncontrollable height. The Ministry had but one choice, to bring forward the abolition of slavery. The cabinet hesitated at the eleventh hour. The House of Commons, in a few days, showed the leader of the Ministry that he must propose emancipation, or not continue to

[224] *Loc. cit.* Major Nicolls was not, however, removed.

[225] *Loc. cit.*, No. 88.

[226] H. V., 1829, Governor's closing speech to the House. The regulations were imposed on the Crown colonies by Royal Order-in-council.

[227] Sess. P., 1831-32, 46, p. 287 (24), enclosure No. 3, in Governor Smyth's Ds. of April 5, 1831. The Governor stated in this letter to a member of the House of Assembly that the abolition of the flogging of women was not a new experiment. He stated that it had been tried in Demarara, Berbice and Trinidad. At least one of these (perhaps all of them) was a Crown colony, where the regulation was imposed by Order-in-council.

carry on the public business." [228] The abolition was accomplished by statute of the imperial Parliament in the spring of 1833, the same year in which the laboring classes in the mother country were relieved of part of the grievous burdens under which they too had been laboring.[229] Thus was done at one stroke what might have been accomplished gradually, and without the necessity of a violent shock to the owners of slave property, but for the course taken by the colonies in evading the recommendations of the home government.

Measures were necessary to provide for affecting the transition from the regime of slavery to that of apprenticeship, as provided for in the abolition act.[230] The old laws governing the relation of the masters and their slaves were

[228] H. V., 1833, pp. 245-250. Address of the Executive to the legislature on the emancipation. In this address it is also stated that had the measure for the emancipation originated in the colonies, it would have been received with increased gratitude and attended with diminished risk, but the experience of the last few preceding years had convinced them that there was no ground for such a hope. The assemblies were less disposed than ever to pass such a law. The Ministry rose to meet the demands of public opinion. This address must have told the truth very plainly, and must have given the local legislators such a view of the state of things in Great Britain, and of what actually did bring on the emancipation, as the Ministry did not want the colonists to have. Lord Stanley almost reproved Balfour for his revelation of the secret motives that lay behind the conduct of the Ministry in proposing this measure to Parliament. He did not deny that the Lieutenant-Governor told the truth in his plain-spoken explanation of the conduct of the Ministry.

The chief of the investigations, referred to in the above quotation from the Lieutenant-Governor's speech, was that of the House of Commons on West Indian slavery, made in 1832. It is printed in the session papers of Parliament for 1831-32, vol. 20, a folio volume of several hundred pages. The information which the committee was instructed to collect was, in the words of the resolution authorizing them, as follows: To note, " (1) Any progressive improvement which may have taken place in the state of the slaves since the abolition of the slave trade in 1807; (2) the actual state and condition of the slaves, the nature and duration of their labor, and evidence as to instances of cruelty, and gross abuse of authority and power; (3) the increase or decrease of the slave population, as respects Africans and Creoles, and as affected by the state and system of slavery; and (4) plans for improving the condition of the slaves, or affecting their emancipation, and opinions as to the probable condition of the negro and the effect upon society in the islands which is likely to be produced by such emancipation." Ds., S. St., 1832, dated August 11.

On the publication of this report, naval officials were ordered to hold their ships in readiness to answer calls upon them to put down violence, which it was feared would result in some places. Secret instructions were sent to the governors of the different colonies to coöperate with the navy in the suppression of any disorders arising from this cause. See circular dispatch of Sept. 1, 1832, and the enclosed secret instructions. There were no serious disturbances in the Bahamas.

[229] Imperial Statutes, 3 and 4 William IV, 73.

[230] *Loc. cit.*

continued in force in the colonies, to which they applied respectively, until the first of August, 1834.[231] Commissioners, authorized by the Abolition Act, were sent to the colonies to assess the valuation of the slaves, on a basis of the average price of them during the period 1822-30, in order to determine the proportion of the twenty millions of compensation money that should be paid in each colony.[232] But the greater part of the labor of providing for the change which was to take place devolved upon the local legislatures. We shall now undertake to set forth what this Colony did for this purpose.

Balfour as Lieutenant-Governor.

Lieutenant-Governor Balfour had begun his administration of the government without the violent and strong prejudices, on the part of the colonists, which Sir James Smyth had aroused against himself. Once relieved of the presence of the latter, the colonists welcomed the assumption of the government by the new representative of the Crown. There was no promise of a relaxation of the efforts to give impartial justice to the negroes, which had been made by the Executive since the coming of Sir James Smyth. On the other hand the class about to be emancipated very soon found in Balfour as earnest an advocate of their interests as they had had in his predecessor. Fortunately for his relations with the House of Assembly, the flogging of female slaves was done away together with slavery, soon after his assumption of the government. The transition to the new system of apprenticeship was effected during his administration.

Rumors of the action Parliament was likely to take had reached the Colony. Holders of slaves had feared this from the earliest agitation of the

[231] Circ. Ds., Sept. 4. 1833, and further proclamation issued stating briefly to all classes what Parliament had done. *Loc. cit.*, and Circ. Ds. of June, 1833.

[232] Circ. Ds. of Sept. 4, 1833. See report of this commission in Sess. P., 1837-38, p. 329. According to this the average price of slaves in the Bahamas for this period, 1822-30, was £29 18 s. ¾ d. per head; the compensation was £12 14 s. 4¾ d. per head. Bermuda alone, of the West Indian colonies, received less compensation per head for her slaves than did the Bahamas. The highest price received in any colony was in Guiana, where the valuation was £114 11 s. 5¾ d. per head, the compensation £51 17 s. 1½ d. In the Bahamas there was a total of 1109 uncontested claims for compensation, and 24 claims involving the ownership of 456 slaves, which caused litigation. Of the classes of slaves according to the definition in the imperial abolition act there were 4020 praedials attached, 270 praedials unattached, and 3444 non-praedials, for all of which compensation was awarded respectively as follows: £53,794 13 s. 10 d., £3655 6 s. 6 d., and £61,233 13 s. 6 d. *Loc. cit.*, pp. 143-9, 344 and 358.

question of amelioration. Proclamations were issued to both slaves and masters, announcing that slavery had been abolished, and that it would be succeeded by an apprenticeship system, and warning all classes to abide by the laws. Slaves were urged to continue in the service of their masters, and the masters on their part to pay due respect to the commands of the officers of the law.[233] The Assembly was prorogued to a later date than that for which it had been called, in order to await the arrival of instructions from the home government, as to the measures which should give effect in the Bahamas to the abolition act.[234]

The Assembly Convened Again.

After almost eighteen months of successful administration of the government of the Colony without consultation with the Assembly, representatives of the people were again called in to provide for the needs of the community. In the interval the feeling against the government was not as high as it had been under the administration of Sir James Smyth. But the people did not forget their grievances against the Ministry and the local government. The abolition coming as it did was received by the slaveholders with sullen silence. The same feeling continued to exist as to the interference of the home government with the slavery question. When the elections for the new House came on, the people returned almost all of the same individuals who had sat in the last House. This did not promise harmony of action with the Executive, nor compliance with the wishes of the Ministry, in dealing with the question that was now uppermost, namely, the provision for the abolition.[235] The members were not disposed to accede to measures that were suggested by those whom they regarded as responsible for the loss of their slave property. Almost everything brought before them in this session had some bearing directly or indirectly on the slave question, so that it was difficult not to encroach upon the already injured feelings of these legislators. The Colony had come to a state of peace, although the old jealousies still slumbered in the breasts of the extreme slave element.[236]

[233] See Circ. Ds. of Sept. 4, 1833. Also Balfour to Stanley, No. 27.

[234] *Loc. cit.*

[235] See House Vote, 1833, p. 1: also *loc. cit.*, 1832, p. 1, cf.

[236] H. V., 1833, pp. 5-7, Lieut.-Governor's address on opening the Assembly. The Lieutenant-Governor stated that one-fourth of the debt of the Colony had been paid off, and that the coöperation of the Assembly was only needed to put the treasury on a firm basis, and to deliver the Colony wholly from debt. He expressed high hopes that harmony would prevail in the labors of the House, and that good feelings would be preserved throughout the session. See also Balfour to Stanley, No. 37.

The first matter disposed of by the House was the extension of privileges to the free black population. The provisions of the resulting statute will show how willing the people were to grant rights to this class. The act passed was entitled, "An act for Relieving His Majesty's free Colored and Black Subjects from all Civil Disabilities." [237] It contained first a declaration that this class should have the same privileges as if they were descended from white parents, and that they would be entitled to give testimony in the courts, after having enjoyed the state of freedom for a period of two years. But, as if this were granting too much at one time, this broad declaration was qualified. Native Africans brought in and manumitted were not to be allowed to give testimony until after six years residence in the Colony, and then only on presentation of a certificate from a justice of the peace, or from a clergyman of the established church, that they were qualified to testify.[238] This statute was allowed to remain in force for two or three years. It was then disallowed by the King.

Struggle over Executive Functions.

The Lieutenant-Governor now laid before the House the abolition act of the imperial Parliament, together with the instruction as to the auxiliary act, which the legislature was to pass, in order to give effect to the provisions of the imperial act. Some of the members of the House seemed to have desired to put on the records of the House a protest against the interference of Parliament in the affairs of the Colony. They were warned by the Lieutenant-Governor that it would not be advisable to do so.[239] The Lieutenant-Governor formed a plan for an auxiliary act, different from that which had been advised in the instructions from the home government, as he thought that that plan would not succeed in operation in this Colony, owing to geographical conditions.[240] But his hopes for coöperation from this Assembly were doomed to disappointment through the intrusion of an old and contested question. The House of Assembly held an indirect control over some of the most important executive functions of the colonial government. Through some means, perhaps, as Lieutenant-Governor Balfour said, by the negligence of his predecessors in the executive government, the House directly appointed the commissioners, who were regularly entrusted with the management of public interests, thus

[237] 4 William IV, Chap. 1.

[238] 4 William IV, 1; H. V., 1833, p. 32. A clause, regarding the giving of testimony in the act of 1829, was repealed by this act.

[239] H. V., 1833, pp. 245-6.

[240] Balfour to Stanley, No. 52.

making them independent of the Executive. These commissioners held in their control the expenditure of certain public funds. Responsible to no authority, they attended to matters hastily, expended money in a loose manner for works that were but indifferently done, for which none could call them to account.[241] Expenditures were specified in the appropriation bill, and the names of the commissioners were placed in the statutes constituting commissions, and authorizing them to act. Likewise the House governed the salary list. In this small Colony, where almost every man was involved in political collisions, private feelings of the legislators were not guarded against in deciding upon, and altering the amounts of, the incomes of the officials.[242] By its use of these powers the House had acquired an influence over the people of all classes, and men looked to it as the source from which the favors in the power of the state were dispensed. The proper influence of the executive was materially weakened.[243] The House had a right to control funds applied to the public service, to see that they were not diverted from their proper uses, and to curtail them if found too large, but after that was done it was not in their province to vote that they were too large, unless they were forced to such a course by the pressure of public necessity.[244] The House had also been able to control the officials or at least to bring pressure to bear on them, and to make their conduct conform to the state of feeling in the Colony. The use of these powers by the House had acted as a checkmate to the influence of the Crown representative. Sir James Smyth had effected a temporary emancipation of the civil list, and certain executive functions, from its grasp. His successor now looked on this as the most favorable time to wrest these powers from the House altogether. He determined to veto bills, by which the commissions were created, unless

[241] H. V., 1833, p. 46, and Balfour to Stanley, No. 61.

[242] H. V., 1833, pp. 147-8, address of Lieut-Gov. to the House. It was not difficult for an official to make himself obnoxious at this time by an impartial execution of the duties of his office, and the House of Assembly was known to be a body that would use the effective weapon it had, in the control of the salary list, to keep officials dependent upon it.

[243] Balfour to Stanley, No. 61. Balfour characterized this dependence upon the legislature as an American feeling, which was due, in his view, to the great distance from the King's person, together with the proximity to, and the constant communication with, the States. And just at this time the feeling was the stronger, owing to the obnoxious measures that were being thrust upon their attention by the home government. The Assembly had been encouraged in its holding these executive powers by the virtual concession of them to it by the executive.

[244] H. V., 1833, pp. 147-8.

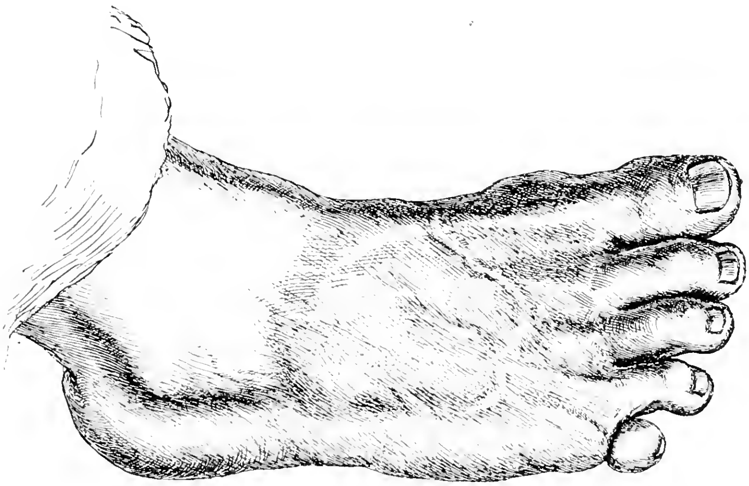


FIG. 1.—FOOT AFFECTED WITH AINHUM OF LITTLE TOE

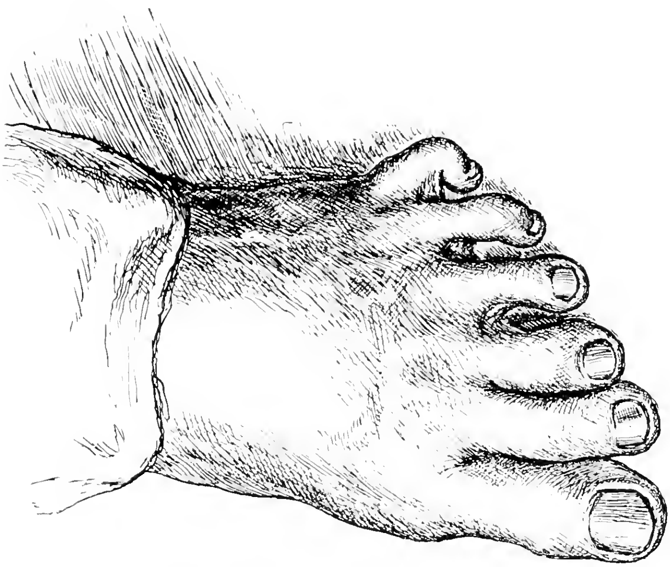


FIG. 2.—LEFT FOOT OF SAMSON ROOKER, SHOWING SIX TOES

VIEWS ILLUSTRATING SANITARY CONDITIONS

they allowed the Crown to select the members of them,[245] and by all means in his power to bring back the colonial government to the "sound constitutional principle of having the responsible servants of the government nominated by the Crown." He was even more jealous of the prerogative than Sir James Smyth had been.

When Sir James Smyth came into the government, the House, through its control of the salary list, held practical control of the Council which was made up almost entirely of salaried officials, and of men who themselves favored the popular view of the slavery question. We have seen how this influence was used for a time and how Governor Smyth relieved the fears of the officials on account of their salaries, and reconstructed his Council, introducing men who were better disposed to the government. The Council was thus brought to favor the policy of the government. But the House on its part was unwilling to see these things pass from its control. Long exercise of the executive functions by its appointed commissioners had caused its members to look on this as the legitimate order of things in a British colony. The Council was looked upon as a body which had no right to reject measures sent up by the House. It was only to ratify bills passed by the House and ought not to resist a demand of the people as embodied in a House bill. It claimed the rights, for which it contended, as fully recognized.[246] The House was jealous of the Executive, and had frequently protested against fancied encroachments of the latter upon its rights. Since the agitation of the slavery question had begun, ignorance of the real intentions of the home government had made the colonists, inside and outside of the House, suspicious of every step the government undertook. They feared schemes for aggrandizement and for the destruction of colonial rights; a snare was seen in every civility of the head of the government, and in "every proposal was an attempt at some unavowed advantage," which illusion only perseverance in "open unoffensive conduct could dispel."[247] Balfour attempted to invite confidence in himself, to explain his intentions, and to be frank and open in everything, but without avail. There was no leader to whom he could appeal, no party to whom he could address himself, no definite policy to be followed. Much time was spent in purposeless speech-making, without any attempt to carry on business. "Any new violent expression of

[245] Balfour to Stanley, No. 61. H. V., 1833, p. 46.

[246] H. V., 1833, p. 300, resolves of the House on the rejection of the market bill by the Council.

[247] Balfour to Stanley, No. 61; see also votes of the House for this session.

opinion was received with applause." [248] The only thing that could bring them together was some suggestion of opposition to the government and its policy.

The first breach of good feeling of the session arose over the market bill in which the House insisted on naming the clerk of the market. The Council, viewing the question from the administrative side, refused to accede to the House bill.[249] A conference of the committees of the two bodies undertook an adjustment of the difficulty. The Council considered the appointment to the clerkship in question as an undoubted executive function, and declared that it would not allow it to become subservient to the caprices "of any body of men however respectable." [250] After the conference a House committee was sent to inspect the records of the Council as to its action on this bill. It was soon found out that the latter body had thrown out the bill.[251] The House at once passed a defiant set of resolutions, holding that it was against the public interests to keep it longer in session, and that it would not appropriate any money for the public buildings and grounds "until the right of the people" over them should be fully recognized, and a bill should have received the assent of the Executive, entrusting the care of the public buildings to a commission of five or more persons named by a House bill.[252] As soon as intelligence of this reached the Lieutenant-Governor he called the members of the House to the Council chamber, where he administered some wholesome admonitions, and sent them back to their constituents.[253]

The Lieutenant-Governor had given warning that he would veto any bill reviving the old boards.[254] The Council had taken the exact course that he would have dictated if he had absolute control of it. Now that the House attacked it, and refused to proceed to business without the absolute submission of the Council, there was no other course left open to the Executive. The Council must have condemned the action of the House, or refused to vote at all,

[248] Balfour to Stanley, No. 61.

[249] The Council at this time had both executive and legislative functions residing in the same body of men. The members were not now in fear of the House, and their connection with the administration had doubtless given them the same view of the results of the House policy that the Executive himself took.

[250] H. V., 1833, p. 260, report of House committee on the results of the conference. This clerkship carried with it certain judicial functions.

[251] *Loc. cit.*, p. 265. The committee reported that the reading of this bill had been postponed for six months.

[252] H. V., 1833, p. 300.

[253] H. V., 1833, pp. 205-206.

[254] H. V., 1833, p. 46.

which latter it decided to do.[255] A collision of the branches of the legislature was approaching, and the experience of the years 1817-1821 was not forgotten. The discord between the branches of the government was as threatening to public interests as it had been at that time, and harmony between the two Houses had become a thing of the past. Such a body, Balfour thought, would not have been fit to deal with the slavery question in the stage to which it had come.

There was a reaction in public sentiment unfavorable to the members of the late House. This was favorable to the government. The advantage, due to the unpopularity of Sir James Smyth, had not been entirely lost. Suspicion still prevailed among the supporters of the late representatives. Many were jealous of the free blacks, who would now enjoy the exercise of the suffrage in the approaching elections for a new House.[256] It was probable that the new elections would result in the return of different individuals to the House, and in a virtual endorsement of the policy of the government. For this reason the writs were issued at once, and a new election was held within ten days after the dissolution. The more moderately disposed candidates were generally successful. But the presence of the extremist element in this House was shown in the first few days of its sittings. James Malcolm, who had been defeated according to the return from Harbor Island, made application for the unseating of the person elected.[257] He had been one of two members in the late House who had consistently voted against the majority. The House determined not to set any day for the consideration of his petition, until he should have entered into a recognizance for £200 to pay the expenses of the investigation, in case it appeared that the unsuccessful candidate had neglected to comply with the provisions of the law.[258] This had the effect of causing Malcolm not to pursue the object of his petition, for which it was doubtless intended. Soon the House voted that, unless the petitioner entered into the bond within three days,

[255] H. V., 1833, pp. 305-6. In dismissing the House the Lieutenant-Governor used strong language, but he thought he was justified in the case that was before him. He had hoped for a peaceful termination of the session. He had borne with many petty taunting actions of the House, hoping that it might become more moderate. See Balfour to Stanley, No. 61.

[256] *Loc. cit.*

[257] H. V., 1834, p. 47. In a scrutiny held in that district after the election, Malcolm had had no representative. On the return of the scrutineers, one of their number was heard to say that he believed, if Malcolm had been represented by a scrutineer, he would have been declared elected. On the strength of this the unsuccessful candidate prayed for an investigation by the House.

[258] *Loc. cit.*, p. 51.

it would not consider his petition at all.[259] The matter was allowed to drop. A few weeks later in the session one of the members for Harbor Island resigned, and Malcolm was allowed to take the seat thus vacated.[260]

Provision for the Coming Changes.

This House had met for the purpose of attending to the business of the Colony. It was necessary first to provide for keeping the slaves until the day when they would pass into the new condition of apprentices. The Registry Bill was reënacted on February 5,[261] and other necessary matters were disposed of. The important work for this session was to provide for giving effect to the Abolition Act of Parliament. A copy of the Order-in-council, that had been proclaimed in the Crown colonies, was sent to the House as a convenient outline for the formulation of the auxiliary act.[262] It was designed to relieve the slaveholders as much as possible in the loss of their property, and to lighten the burdens of the bondsman in the same manner. But the suggestions of the Ministry were not made in the form of demands. Slavery had been given its deathblow by the home government, and now everything was to be done to assist the afflicted colonies to make the best of a bad situation, which was, however, almost inevitable in the annals of nineteenth century progress in civilization. The apprenticeship system was recommended, as the most beneficial to the negroes, and as least burdensome to the masters, but the express instruction was that "neither as individuals nor as a legislature were they bound to continue the state of slavery, or apprenticeship, for an hour." [263]

The House set to work at once. A committee investigated the points touched upon in the Lieutenant-Governor's speech at the opening. Difficulties arose, owing to the ignorance which prevailed, on the part of both House and Executive, as to the share which this Colony was to have in the establishment provided for by the Abolition Act.[264] The act was passed, and the necessary provision for the introduction of the apprenticeship system on August 1, 1834,

[259] *Loc. cit.*, p. 68.

[260] *Loc. cit.*, p. 111.

[261] H. V., 1835, p. 176, the defects of this act are pointed out here.

[262] H. V., 1834, pp. 19-47.

[263] H. V., 1834, p. 5.

[264] This is especially true as to the number of the special magistrates that were to be allotted to this Colony. For a description of these magistrates and their powers, see next chapter. For the recommendations of the House committee, see H. V., 1834, p. 169.

was made.[265] There was an attempt to revive the old difficulties, over the appointments, during the session. A measure was introduced containing in itself the names of the commissioners of the public buildings.[266] The Lieutenant-Governor sent in a timely warning that he would allow no one but himself to appoint the buildings commissioners.[267] Several days later the House expressed its view again in a set of resolutions much milder than those of the previous session, but still claiming the right for which it had been contending.[268] The Council still stood in the way of the passage of the measure.[269] After conferring with the Council in the attempt to adjust the difficulty,[270] it was allowed to go over to the next session. The result thus far had been a victory for the government. The House could not dictate the appointments, and the Executive assumed the control to which he laid claim.

On the approach of the day on which slavery was to come to an end in the British West Indies there was much apprehension on the part of the whites that there might be uprisings among the slaves. Rumors had spread among the latter alleging good fortune to them far beyond what the home government had expected to grant them. But a part of their ignorance of their approaching condition was assumed rather than real.[271] The Lieutenant-Governor issued proclamations to both blacks and whites, urging them to be orderly, the masters to use every influence for the preservation of peace, and the slaves to remain in the service of their masters, whom they would have to serve several years longer.[272] The clergy of all denominations, who were enlisted in the cause of order, were very influential among the lower classes. The private secretary of the Lieutenant-Governor was sent with the proclamations among the Out-islands to read them to the people there. Everywhere he was listened to with confidence by the slaves, as he wore the uniform of a soldier. The effect of his

[265] See 4 William IV, 21. See on this act the following chapter on the legal status of the apprentices.

[266] H. V., 1834, p. 102.

[267] *Loc. cit.*

[268] *Loc. cit.*, pp. 155-156.

[269] *Loc. cit.*, p. 206.

[270] *Loc. cit.*, p. 253.

[271] In some places the private secretary of the Lieutenant-Governor on his trip to the Out-islands found wild misconceptions as to what the negroes were coming to. In one place it was believed not only that they were to become free, but also that all troubles were at an end, and that the King was going to give them bread all the rest of their lives.

[272] Sess. P., 1835, 50 (Part 2), pp. 251-2, and 261. Copies of these proclamations.

explanations and admonitions to the ignorant Africans was most salutary,[273] although disturbances at the Turks Islands required the sending of troops to restore order. At Exuma and Eleuthera petty disorders were soon quieted. At Nassau the whites took offense at the proclamation of the Lieutenant-Governor, which intimated that it was possible for them to commit acts which would deserve punishment, and fifteen out of sixteen copies of the proclamation, posted about the city, were torn down within twenty-four hours.[274] The detachment of the second West Indian regiment, which had long been stationed at Nassau, was withdrawn during this summer, pending a change in the troops. Their absence was an additional reason for apprehension to the people.[275] The delay in the arrival of the special magistrates who were expected with the July mail packet was an additional cause of apprehension;[276] but as the day of liberation approached the people did not become more disorderly, and, as if they appreciated the meaning of the great event that was taking place, they allowed that day to pass quietly, and slavery in the Bahamas passed away forever.

PERIOD OF THE APPRENTICESHIP SYSTEM.

A New Regime Instituted.

In undertaking the great movement for the emancipation of the slaves the English people intended to improve the condition of the negroes. The laboring classes in the English plantations had been in bondage throughout the history of those communities. Political rights were denied them, they were crowded to the bottom of the social scale, and the proceeds of their labor went to nourish and strengthen their masters. From being mere bondsmen they had been reduced to the condition of slaves, a very name from which men would shrink. The order was now to be changed. A movement began in the latter part of the eighteenth century which little by little gained the strength necessary to remove these legal discriminations against the negro. This movement first accomplished a denial of the right to carry on the traffic in African men and women in English territory and waters and on the high seas; after that the amelioration of the condition of the slaves and free negroes in the British possessions was undertaken. This latter object was pursued until the British Parliament was led to the point of dealing decisively with the

[273] Balfour to Stanley, No. 113.
[274] *Loc. cit.*
[275] *Loc. cit.*, No. 115. This withdrawal proved to be only temporary.
[276] *Loc. cit.*

FIG. 1.—LEFT HAND OF SAMSON ROOKER, SHOWING POLYDACTYLISM

FIG. 2.—RIGHT HAND OF SAMSON ROOKER, SHOWING POLYDACTYLISM

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slave institution. The slave was now to be given equal rights with his late master in every way that the law could define those rights. "The great cardinal principle of the law for the abolition of slavery," wrote Lord Glenelg in 1837, "is that the apprenticeship of the emancipated slaves is to be immediately followed by personal freedom" in the same way as it applied to the other subjects of the British Crown.[277] The old order in which the slave had rendered "implicit obedience" in return for the "maintenance of his life and health" was to be supplanted by one in which the negro could command himself just as the white man was doing.

The apprenticeship system was not forced upon the colonies by the great emancipation act. It was left to the Colony either to accept the labor force according to such a system, under regulations imposed by Parliament, or to set the slaves entirely free, if that were preferred.[278] It was wisest for the industrial interests of the Colony as well as more profitable for the owners of the slaves to accept the apprenticeship system. The status of the apprentices was defined in outline by Parliament. The colonial legislatures were allowed to enact such supplementary legislation, not repugnant to the abolition act, as was necessary for complete regulation of the laborers.[279] The plan of the home government was to secure eventual freedom for the entire laboring classes, which state a few in the colonies were already enjoying. Before emerging into full freedom, however, these ex-slaves were to pass through a term of semi-dependence on their late masters during which they were to exercise certain rights of freemen, their interests were to be carefully attended to by a corps of special officials for the purpose, and the whole period was to be a true apprenticeship to serve as a preparation for the responsibilities of freemen, which they were to assume at its close. As an additional compensation for the loss of their slaves it was arranged that they should serve their former masters to the end of this term.[280]

Classes of Apprentices.

With the exception of children of a certain age, there were two classes of the apprentices, distinguished according to previous occupation, (1) prae-

[277] Ds., S. St., 1837, Circ. of Nov. 6.

[278] H. V., 1834, p. 5. Address of Lieutenant-Governor Balfour to the Assembly.

[279] Imp. Stats., 3 and 4 William IV, 73, sec. 16. Any improvements the legislatures might make on the regulations of the imperial statute were to become binding on confirmation by the King-in-council. For the colonial act, see 4 William IV, 21.

[280] Imp. Stats., 3 and 4 William IV, 73, sec. 16.

dials, and (2) non-praedials. The praedial apprentices were those, who as slaves had been employed in agriculture or in the manufacture of colonial produce.[281] Of this class those employed on lands belonging to their owners were designated as praedials attached to the soil,[282] and were not removable from the plantations on which they were employed, without the consent of a special justice of the peace.[283] Those employed on lands not belonging to their former owners became praedials unattached, and were removable at the discretion of the employers. All slaves not included in the above description, such as day laborers, household servants, skilled artisans, sailors and others became non-praedials.[284] Children below the age of twelve were excluded from the class of praedial apprentices, except those who had been employed in agriculture for twelve months previous to the passage of the abolition act.[285] The intention of Parliament in passing the act had been that the non-praedials should be entirely freed after a term of four years, and the praedials after six years, thus freeing the colonies of the whole system on August 1, 1841,[286] but at the end of the four-year term of the non-praedials the Colony released all its laborers from involuntary servitude, fully accomplishing the immediate objects of the friends of the emancipation.[287] The Bahama negro was now a freeman, which it was the intention of his benefactors in Great Britain to make him. But his freedom was abridged in many respects, as we shall see, and he was far from being wholly responsible for himself or from being thrown upon his own resources. The Secretaries of State for the Colonies were very fond of writing of the negro apprentices as they did of "any other freemen," or "any other of His Majesty's subjects." The colonists on the other hand were reluctant to admit that the negro was a freeman, or to grant him the rights which the home government demanded for him.[288] They

281 Imp. Stats., *loc. cit.*, sec. 4.

282 *Loc. cit.*

283 5 William IV, 8 (10).

284 Imp. Stats., 3 and 4 William IV, 73 (4), and Bahama Statutes, 4 William IV, 21.

285 Imp. Stat., 3 and 4 William IV, 73 (4).

286 *Loc. cit.*, secs. 5 and 6. This would not have prevented the holding of children bound out until they reached the twenty-first year of age, from being held after August 1, 1841; nor those under sentence for an extension of the term of apprenticeship for attempted desertion or other offense.

287 On the release of the praedials, see 2 Vic., 1.

288 See on this Sess. P., 1835, 50 (part 2), p. 253 (59), Ds. of Secretary Rice to Lieutenant-Governor Balfour in which he criticises the auxiliary statute of the Bahamas. Also H. V., 1834 (extra session), pp. 103-104, report of House committee on the objections to their enactment. See further concessions by the Assembly in the statute, 5 William IV, 8.

regarded him with jealousy, guarded him carefully, denied him privileges, erected barriers about him, and still preserved towards him that same attitude which they had formerly assumed towards their slaves. It was only by that persevering attention of the home government, working through the local government, that additional guarantees were secured for the benefit of the apprentices.

LEGAL STATUS OF APPRENTICES.

The subject of the legal status of the apprentices will be discussed first from the standpoint of the apprentice, and second from the standpoint of the employer. Under the first will be considered the rights, privileges, etc., of the apprentice in the following order: (a) maintenance, (b) personal rights, (c) rights pertaining to contracts, (d) marital and family rights, (e) corporal punishment, (f) manumission, (g) other rights. The second division or the rights of the employer will be discussed under the following heads: (a) property in the services of the apprentice, (b) right to return runaways, (c) enforcement of obedience, (d) prohibitions on apprentices. Lastly will come the question of dealing with children.

RIGHTS AND PRIVILEGES OF THE APPRENTICE.

Maintenance.—The apprentice was still dependent on his employer for the necessaries of life. The same allowances were required in this respect which the slave owners had been required to furnish to their slaves.[289] But in this system an alternative was provided in that in lieu of provisions and clothing the employer could furnish to the apprentice an equivalent in land for cultivation, or in time or money, according to the terms of approved agreements.[290] If land was furnished, a portion of the working time of the apprentice, to which the employer was otherwise entitled, was placed at the disposal of the former for purposes of cultivation. These lands were required to be accessible to the laborer's habitation.[291] Apprentices over fifty years of age and those affected with bodily infirmities remained as a charge upon their employers, if dismissed from service by an instrument in writing.[292]

Personal rights.—The apprentice now came into the life of the Colony with many important rights of a freeman. His personality was now recognized in

[289] Imp. Stats., 3 and 4 William IV, 73 (11).
[290] 4 William IV, 21.
[291] Imp. Stats., 3 and 4 William IV, 73 (11).
[292] 4 William IV, 21 (7).

law, in the courts, and in his relations with his employer, and he was henceforth to be considered as a part of the Colony, affected by things undertaken and done in the name of the State. He was nominally placed on an equal footing with the most privileged persons in the Colony. In practice we shall find that he did come into the enjoyment of rights gradually, and that recognition, except social, was granted him. He could now hold real and personal property with all their attendant rights, and could sue, or be sued, in the courts of law and equity.[293] These things were guaranteed and recognized at the beginning of the apprenticeship period; some other rights were, however, withheld for a time. The legislature persisted in denying them to apprentices and only late in the apprenticeship period did it finally grant them. It was thus with the right to personal freedom. The auxiliary abolition act bound the apprentice to the plantation where he was employed, allowing him to leave it, as of old, only with the consent of his master. Even on the disallowance by the British Ministry,[294] the same provision was reënacted to keep the apprentices on the plantations where they belonged,[295] except on holidays and Sundays, when, according to superimposed regulation, they were allowed a certain latitude to attend religious services.[296] This remained the rule until the year 1837 when at last the master's pass card was expressly declared to be no longer necessary to enable the apprentice to go freely from place to place at any time "day or night, except during the hours of compulsory labor."[297] Confinement of apprentices for safe-custody was limited to cases in which other subjects of the Crown could be confined.[298]

From another important point of view this Colony insisted on further restricting personal liberty. There seemed to be a fear that, on the emergence of this poor people into the state of freedom, there would be a tendency to wanton idleness and mischief-making. Steps were taken to forestall any such tendency. A vagrancy law was passed in the year 1833,[299] when the members of

[293] 4 William IV, 21.

[294] Sess. P., 1834, 50 (part 2), p. 253 (59). Ds. of Secretary Rice to Balfour.

[295] 5 William IV, 8 (8).

[296] 3 and 4 William IV, 73 (21).

[297] 1 Vic., 19 (22). There is reason to believe that this regulation was enforced as persistently as its retention on the statute books demanded. There was always the fear that the negroes might assemble to concoct dangerous plots, or to rise in insurrection, if they were allowed to go as they pleased. There was also a desire to have the negroes, whether slaves or apprentices, in their places at all times.

[298] 5 William IV, 8 (1).

[299] 4 William IV, 2, passed Nov. 12, 1833.

the House had not recovered from their violent state of agitation at the conduct of Sir James Smyth, and an amendment was passed in 1835,[300] which, taken together, formed, in the words of the Secretary of State for the Colonies, "the most arbitrary vagrancy law in the West Indies." "Hard labor and imprisonment" threatened all idle, drunken and disorderly persons, and those who could not give account for the correctness of their lives,[301] and the possession of a kit of burglar's tools branded the holder as a rogue or vagabond to be dealt with summarily.[302] It was evidently aimed at the emancipated classes, and the Governor was given powers capable of great abuse.[303] These same acts forbade under penalty of five days imprisonment the assembling for "no specific and lawful object, loitering and carousing . . . in the liquor shops, loud singing or whistling, flying kites in or near highways, and calling loudly in the markets to attract customers."[304] Apprentices could leave the Colony with the consent of the masters, and could secure passports certifying to their identity.[305]

Rights Pertaining to Contracts.—A more liberal spirit was shown in the regulations between the employers and apprentices. Every agreement to which an apprentice was a party had to be attested by one or more literate witnesses.[306] This provision seemed not to have operated successfully. It seems probable that there was a laxness in securing to the negroes a full understanding of the terms of the contracts into which they entered. In 1837 a full understanding of all agreements was made necessary to give binding force to contracts with apprentices.[307] The most common form of agreement was that of task work which was substituted for the regular labor of the apprentice.[308] This form of contract was employed to some extent from the beginning of the apprenticeship

[300] 5 William IV, 17, passed Jan. 1, 1835.

[301] *Loc. cit.* See also Sess. P., 1836, 15 (appendix), pp. 77-78.

[302] 5 William IV, 17.

[303] Sess. P., *loc. cit.* Part of the danger in this lay in that when some local man became administrator of the government for a time the disposition to apply these acts strictly could easily work great wrong.

[304] See these acts in Sess. P., 1836, 49 (appendix), No. 66. These laws were still in force on February 2, 1839. See *loc. cit.*, 1839, 37, p. 487 (17). In a despatch of this date from Lord Glenelg to Lieutenant-Governor Cockburn, the latter was instructed to press the legislature to repeal them, and meantime to use his discretionary powers to mitigate the evils that might result from the application of them.

[305] 4 William IV, 21.

[306] 4 William IV, 21.

[307] 7 William IV, 8 (1).

[308] See 4 William IV, 21, on the authorization of this form of agreement.

system. It became very popular with both employers and laborers,[309] on account of its mutually advantageous features. At the end of the apprenticeship system many of the laborers were eager to continue in the service of their former masters under agreements similar to those under which they worked as apprentices,[310] based upon the principle of mutual agreement before witnesses. Agreements or contracts could not in any case be made binding for a longer period than twelve months, after the expiration of which period they must be renewed. This provision seemed to have been easily enforced, and it became the most satisfactory and beneficial feature of the whole apprenticeship system. Its operation was subject to some difficulties and disagreements, but it placed a certain responsibility upon the negro, to which he responded, and it gave him a recognition as a person, which encouraged him to rise to meet that responsibility and to cope with his circumstances. It allowed the enterprising to gain time to utilize for their own purposes; it made it possible for many to bargain for their own freedom, and to gain it. After the year 1835 record books were kept on each plantation in which were entered records of all agreements entered into by apprentices on that plantation. These were entered by a special justice. In case of disagreement as to the terms of a contract, it was ascertained whether the apprentice fully understood the terms of the agreement before the case was decided.[311]

In the absence of task-work agreements, the employers were allowed to employ their apprentices forty-five hours each week, all work to be done between sunrise and sunset on Mondays to Fridays inclusive. Saturdays and Sundays were left at the disposal of the apprentices.[312] Contracts voluntarily entered into between employers and apprentices, and with the consent of a justice, were enforcible in the courts of the Colony under penalties on the violators of them.[313]

Marital and Family Rights.—Almost the same rights as to marriage and family prevailed here as in the latter part of the history of slavery. Some of the restrictions of that time were removed. Marriages could now be celebrated

[309] See reports of the Stipendiary Justices Winder and Hill, from the several Out-islands, in Sess. P., 1836, 49, pp. 543-545. Colebrooke's Ds. of Jan. 9, 1836.

[310] Sess. P., 1839, 37, 487 (pp. 12 and 14). Cockburn to Glenelg, Nos. 92 and 99.

[311] 5 William IV, 8 (4).

[312] 4 William IV, 21 (17-19). Also Sess. P., 1839, 37, p. 487 (4), remarks of Attorney-General Anderson on the Imperial Act, 1 Vic., 19, amending that of 3 and 4 William IV, 73.

[313] 4 William IV, 21.

by the clergy of all denominations, or by any authority competent to celebrate marriages between other free persons.[314] Other rights and privileges, attendant on the marriage bond, were now in the possession of the negroes as with other freemen. The separation of husband and wife, or of parents and children, was forbidden.[315]

Corporal punishment.—Parliament no longer hesitated to declare itself as to the flogging of women. The imperial abolition act plainly forbade such punishments for the future. The colonists acceded to this provision.[316] Punishments of male apprentices were also restricted. Masters applied the lash to them only with the consent of a special justice. Other modes of punishment were recommended. Corporal punishment fell into disfavor, was less frequently employed and finally before the end of the apprenticeship period it was dispensed with altogether.[317]

Manumission.—Every facility was given to apprentices to become freemen. Although the apprenticeship was to continue for the period of four years, means were provided by which the apprentices could become free before the end of that period, and in some cases even without the consent of their employers.[318] An employer could set his apprentice free by an instrument in writing attested before one or more justices of the peace, thus absolving the apprentice from obligation for service during the unexpired term of his apprenticeship.[319] In case of joint ownership of an apprentice, either of the parties entitled to his services was competent to make a valid and complete release of the laborer from obligation to the joint owners.[320] A negro illegally held as an apprentice was authorized to sue for his freedom. On presentation in court of the proof of the right to his freedom he could recover nominal damages, in addition to wages for the time during which he was illegally held to service.[321]

[314] 5 William IV, 8 (6). See also 4 William IV, 21.

[315] 5 William IV, 8 (11). The auxiliary abolition act allowed the separation of children over fourteen years of age from their parents. This was repugnant to the act of Parliament (sec. 9), and the Secretary of State called attention to the fact in his comments on the auxiliary act. Sess. P., 1835, 50 (part 2), 258. The Assembly later adopted the improvement suggested by this despatch.

[316] See 3 and 4 William IV, 73 (17), of Imp. Stats., and 4 William IV, 21, Col. Stats.

[317] Sess. P., 1836, 49, p. 532, Colebrooke's report on the apprenticeship system, in his despatch of Oct. 8, 1835. Also Colebrooke to Glenelg, No. 85.

[318] Imp. Stats., 3 and 4 William IV, 73 (8).

[319] 4 William IV, 21.

[320] *Loc. cit.*, sec. 8.

[321] 4 William IV, 21.

Other Rights.—Apprentices were allowed certain other rights and privileges of British subjects which had been denied to them as slaves. The same spirit on the part of the white inhabitants, that had been shown elsewhere, was shown here. Only after attention had been called to the rigidity of these restrictions,[322] were they repealed by the Assembly. The auxiliary abolition act of the Bahamas disqualified apprentices for jury service, forbade them to serve as arbitrators, or on appraisements, or to hold elective or other positions in His Majesty's service, whereas the home government had only intended in its restrictions to give the apprentices "no military or political authority."[323] These restrictions were later removed in the Bahamas. Military service or service in any civil capacity, to which the governor might call the negroes, was enjoined upon them just as upon other British subjects, provided they did not interfere with the performance of services due to the masters.[324]

Rights of Employer.

The employers still retained many rights over those who had been their slaves. In these relations there was an approach to the English system of apprenticeship in which a young person was bound out for the purpose of learning a trade. The additional restrictions, here due to West Indian race prejudice, varied the adaptation of the system to the Colony. Obligations were mutual between master and apprentice. The master taught the apprentice a trade, which was to the interest of the former as well as of the latter, in return for the use of his services for the whole period. We shall now take up the relations of employer and laborer from the standpoint of the master.

Property in the services of the apprentice.—The services of the laborer were the property of the master and under certain limitations could be subjected to any disposition which the employer could make of other property. The employer was entitled to the services of the apprentice for forty-five hours each week. This rule prevailed in the Bahamas throughout the whole apprenticeship period.[325] There were restrictions on the employment of certain of the apprentices during this time. Praedials attached could be removed from place to place only with the consent of two or more special justices, even if it were for the purpose of working the lands of the same employer.[326] This kind

[322] Sess. P., 1835, 50 (part 2), p. 258.
[323] Sess. P., *loc. cit.* Also 4 William IV, 21 (secs. 14, 23 and 51).
[324] 4 William IV, 8 (12).
[325] 5 William IV, 8 (8).
[326] *Loc. cit.*, sec. 10.

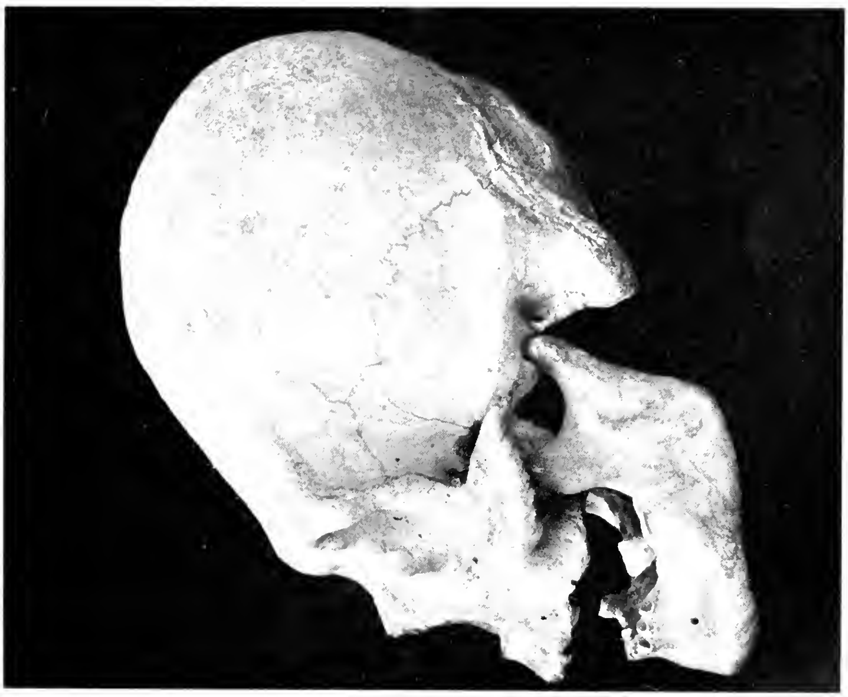


Fig. 1.—PROFILE OF LUCAYAN SKULL

Fig. 2.—FRONT VIEW OF LUCAYAN SKULL

VIEWS ILLUSTRATING HISTORICAL RESEARCHES

of removal could not take place when it involved the separation of a laborer from his wife, or of a parent from his children.[327] The imperial abolition act forbade the removal of apprentices from the Colony without the consent of two or more special justices.[328] The services of the apprentice, as property, were alienable by sale, gift, deed, or in any other manner of conveyance, but in every such case the transfer had to be made under the attestation of one or more witnesses. The laborer's services were not transferable at public auction except under judicial process, or in case of a judgment for debt against the person entitled to them.[329] In any such case the separation of families was forbidden, or of those reputed to be in such relations to each other.[330] A husband became entitled to the services of apprentices belonging to the wife previous to marriage.[331]

Right to return runaways.—Runaways and deserting apprentices were to be returned again to service. An apprentice being absent from service for seven and a half hours in any one week could be declared a deserter. He thus became liable to a penalty of hard labor for one week; for an absence of two days the penalty was two weeks of confinement, and fifteen lashes, and for an absence of a week, one month of hard labor and thirty lashes.[332] But in lieu of or in addition to these punishments, vagabonds and runaways, and others unfaithful to their obligations, except those working under pecuniary contracts, were punishable by additions to time. These additions were limited to fifteen hours in any one week. Deserters absenting themselves for any considerable length of time could be punished and the employers remunerated by additions to their term of service equivalent to the time during which they were absent.[333] These additions to time could not in any case be extended so that serving out the penalty would continue beyond August 1, 1841, one year after the expiration of the term of the praedials.[334] On the whole there were not many offenses involving additions to time as the penalty.[335]

[327] *Loc. cit.*
[328] Imp. Stats., 3 and 4 William IV, 73 (9).
[329] 5 William IV, 8 (11), and 4 William IV, 21.
[330] 4 William IV, 21.
[331] *Loc. cit.*
[332] 4 William IV, 21.
[333] *Loc. cit.*
[334] Imp. Stats., 3 and 4 William IV, 73 (20).
[335] In one case a penalty of ten months' extension of the term was added for an absence from service for that length of time. The Secretary of State for the Colonies was much concerned about it, but withdrew the objection to the extreme penalty on being informed of the facts of the case. Sess. P., 1836, 49, p. 537, Ds., Colebrooke to Glenelg and reply.

Enforcement of obedience.—The employer had the same right to require obedience to his commands that he had had under the old slave system, and in case of resistance to apply to a special justice to supervise the infliction of the penalties. There was for a time a disposition on the part of the masters to regard the apprentices in the same light as they had their late slaves, as if they would have recognized no changes in the relations between the two classes. These self-deluded individuals were soon undeceived as to the ability of a new judiciary to deal with such matters, and to effect a real as well as a nominal change in relations. The Bahama auxiliary abolition act authorized masters to punish boys under fourteen and girls under twelve years of age as parents and guardians were accustomed to punish children in the mother country.[336] Evasive provision—Secretary Rice asked for its repeal, which was accordingly granted in 1835.[337] Indolence, drunkenness, fighting, and other such conduct, were punishable on complaint by the employer and conviction before a special justice of the peace.[338]

Prohibitions on apprentices.—Apprentices were not allowed to leave the plantations on which they were employed during working hours without the consent of the masters.[339] Another prohibition on apprentices, which was also disallowed by the King, was to the effect of forbidding the production by them of things that were produced upon the plantations where they were employed.[340] It was also unlawful for an apprentice to bear arms without the consent of his master.[341]

Children.—Persons entitled to the service of the mother of a child could not be compelled to accept the latter as an apprentice in virtue of its relation to its mother. Such children not apprenticed were supported by their parents if not otherwise provided for.[342] Children under six years of age, born after August 1, 1834, if not adequately provided for, could be bound out by special justices to the persons in each case entitled to the services of their mothers for

[336] 4 William IV, 21 (48).

[337] 5 William IV, 8 (13).

[338] 4 William IV, 21.

[339] *Loc. cit.* Secretary Rice objected to this and the King disallowed it, but it was renewed by the Colonial Statute, 5 William IV, 8 (8).

[340] Sess. P., 1835, 50 (part 2), 516. Copy of the Order-in-council dating July 31, 1835, which disallowed the above mentioned section of the Colonial act, 4 William IV, 21.

[341] *Loc. cit.* This prohibition included swords, fire-arms and gun-powder, any of which any master was authorized to seize, if found unaccountably in the possession of an apprentice.

[342] 4 William IV, 21.

terms of service extending to the twenty-first year of age.[343] In such apprenticeship time and opportunities were to be given for proper education and religious instruction.[344]

The Special Magistracy.

The home government determined not to make the application of the regulations in the new system dependent upon the Colony. There had already been too much experience of the reluctance of the West Indian Englishman to grant expressly acknowledged rights to the negro to trust him with the application of the new regulations. There was nothing to warrant a continued faith in the disposition of the late slaveholder to treat his apprentice with impartiality under a new system of regulations which granted extended liberties to the latter. A special magistracy was erected for the application of the regulations of the new system. The magistrates were appointees of and were commissioned by the Crown. There were twenty of these magistrates for the whole of the West Indies, three of whom were at first allotted to the Bahamas.[345] The colonial legislatures were allowed to authorize the appointment of any number of special justices, to be specially commissioned by the governors and paid by the colonies.[346] The Bahamas employed fourteen of these justices during the first year of the apprenticeship system.[347]

All these magistrates bore special commissions under which they were authorized to deal solely with the masters and servants as freemen, in the new

[343] All such apprentices were freed by the cancellation of the indentures of all Africans in the Colony after the release of the apprentices in 1838. See next section.

[344] Imp. Stats., 3 and 4 William IV, 73 (13).

[345] Imp. Stats., 3 and 4 William IV, 73 (14-15), and Balfour to Stanley, No. 108.

[346] Imp. Stats., *loc. cit.*, sec. 14.

[347] 4 William IV, 42. The legislature not being in session at a convenient time, Lieutenant-Governor Balfour called a meeting of the Council and made an arrangement by which seventeen persons were asked to act in the capacity of special justices without further promise of remuneration than that the question of paying them for their services would be laid before the legislature at its next session. It was not desirable to be forced to the adoption of such an alternative, but owing to the conditions existing in the Bahamas, it was not possible to serve the whole Colony adequately with only three justices. To relieve the embarrassment it was necessary to accept the lesser of the two evils and to set up an unsatisfactory magistracy rather than to do without. Something had to be done to institute the new system in all parts of the Colony, and to prevent lawlessness. Otherwise the masters might have been driven to resort to a complete emancipation of their apprentices. Balfour to Stanley, No. 108.

relations into which they had entered. Over these they were given exclusive jurisdiction.[348] The individuals bearing these commissions were not, however, forbidden to bear commissions as general justices of the peace,[349] in which capacity the governors availed of the services of some of them as long as they were in the Colony.[350] The duties of these justices were narrowed down to the regulations of the relations between the employers and employees, and were kept distinct from the duties of general justices of the peace. In some petty offenses there was concurrent jurisdiction of special and general justices, but only a special justice could take cognizance of offenses of employer against employee, and vice versa.[351] Outside of this the general justices could act, under ordinary circumstances, in suppressing disorder and misconduct that had a tendency to breach of the peace.[352]

For purposes of administration the Colony was divided into seven districts.[353] In each of these districts one or more special justices was to reside and make periodical visits to all the settlements within its limits.[354] Lieutenant-Governor Balfour located the three English justices, who came at first, in places from which they could visit all parts of the Colony. One was placed at New Providence, another at Eleuthera and a third at the Turks Islands.[355] The local justices, as distinguished from the English justices, were generally resident proprietors or overseers in the islands over which they had jurisdiction.[356] This arrangement was destined to continue in full force only until March of 1835, the time of the coming of William Colebrooke, the successor of Balfour in the Bahama government. Under this first arrangement nothing of importance was accomplished in adapting the apprenticeship system to the requirements of the Bahama Islands. The reasons for this and the reforms which were finally introduced will be discussed in the following section.

[348] Imp. Stats., 3 and 4 William IV, 73 (18-19).

[349] *Loc. cit.*, sec. 11.

[350] See *e. g.*, Sess. P., 1836, 49, p. 512, instructions of the Secretary of State.

[351] *Loc. cit.*, p. 519, also p. 517, circular instructions to the magistrates.

[352] *Loc. cit.*

[353] 4 William IV, 42. This statute gives the districting of the Colony as follows: 1. Turks and Caicos Islands, Inagua and Mayaguana; 2. Crooked and Acklin Islands and Cays; 3. Rum Cay, Watlings Island and San Salvador; 4. Eleuthera and Harbor Island and Cays; 5. Exuma and Cays, Long Island, Ragged Island and Cays; 6. Abaco, Grand Bahama and Cays; 7. New Providence, Andros, the Berry Islands and Cays.

[354] *Loc. cit.*

[355] Colebrooke to Aberdeen, No. 9.

[356] *Loc. cit.*

Reforms in the Magistracy.

This system as instituted with the local justices did not continue long, but it had done harm to the cause of reform. Colonel Colebrooke came in March, 1835, and in his first despatch on the magisterial system he pointed out defects which were demanding remedy. From reports of the magistrates he found out that the expense of the existing system was too great, that many settlements on the Out-islands were not being visited often enough, and that the salaries of the magistrates were not large enough to maintain those officials as they should have been.[357] A little later he discovered also that the local justices were altogether incompetent to perform the duties required of them.[358] Wherever the English justices had gone in the Out-islands the effect of their visitations was altogether salutary. Disorders were suppressed, quiet was restored, and the spirit of insubordination that had prevailed in some places was calmed.[359] It was, however, physically impossible for them to make the tour of all the Out-islands in any reasonable period of time, and the exposure to heat and rain was so great as to incapacitate them, in a large measure, for their work. The local justices had, on the other hand, generally failed to keep the peace, or even to gain the confidence of either negroes or whites;[360] they had too often neglected their duties in their districts and had punished offenses severely and indiscriminately with the result that harmonious relations between the classes were not promoted or encouraged.[361] The calls from the Out-islands for the stipendiary justices continued to increase, and it was imperative that some one should be sent to them to adjust matters between the employers and their men.[362]

Lieutenant-Governor Colebrooke determined upon a reformation of the whole magisterial system. He applied to the home government to send out as many more of the special justices as possible, urging that any number of them, however small, would aid in the restoration of order. The House of Assembly concurred with him in the necessity of securing, by some means, a more efficient service from the magistracy, and on the recommendation of the executive voted to change the whole plan to that of a system of circuits. The cost of this promised to be less than that of the system then in operation. It also

[357] Colebrooke to Aberdeen, No. 9.
[358] *Loc. cit.*, No. 60.
[359] H. V., 1834-35, p. 184; also Colebrooke to Aberdeen, No. 53.
[360] Colebrooke to Aberdeen, No. 22.
[361] *Loc. cit.*, No. 60, Aug., 1835.
[362] H. V., 1834-35, p. 184.

gave such promise of improved service that a termination of the prevailing irregularities seemed almost in view. The change was accomplished within three months after the arrival at Nassau of Colonel Colebrooke.[363] The Assembly authorized the Lieutenant-Governor with the consent of his Council to divert the funds, that had been applied to the local magistracies, to the support of the circuits under the new system.[364] The salaries of the local justices were discontinued in April, 1835.[365] In June, 1835, the Secretary of State for the Colonies sent out an instruction, to the effect that the commissions of all magistrates who were pecuniarily interested in apprenticed labor should be revoked, and that the number of those who had been habitually resident in the colonial society should be reduced as low as was consistent with the due execution of the law, stating that it was inconsistent with the intentions of Parliament that the powers of a special justice should long continue to be exercised by any such person.[366] Before December, 1835, eighteen of these justices had resigned, or had been removed, fifteen of whom seemed to have been removed under the order of the circular referred to.[367] The Lieutenant-Governor ordered the ordinary justices of the peace to make certain visits in their districts and to quell disorders, though without power to enforce the abolition laws.[368] The Secretary of State was unable in the fall of 1835 to obtain from Parliament a grant for an additional number of magistrates for the Bahamas, but he authorized the Marquis of Sligo at Jamaica to transfer one special justice from that Colony to the Bahamas as soon as the service there would permit.[369] In October, 1835, he did secure from Parliament provision whereby he was able to send to the Bahamas two more special justices. These were rendered necessary, as we have seen, by the revocation of the commissions of the

363 Colebrooke to Aberdeen, No. 22. All the settlements were not in such a state of disorder as has been stated of some of them. At Eleuthera the magistrates' constables had succeeded in keeping a certain measure of good order, *loc. cit.* Two magistrates and a detachment of troops were sent to Exuma where the insubordinate laborers of Lord Rolle had refused to work, H. V., 1834-35, 184. Both of these places had grown quiet by the latter part of August, 1835, Colebrooke to Glenelg, No. 86.

364 Colebrooke to Glenelg, No. 36.

365 Sess. P., 1836, 49, p. 514. Circular of Col. Secretary Nesbitt to the Local Magistrates.

366 Circular instruction to the governors of the colonies, dating June 15, 1835. See H. V., 1835-6, p. 29.

367 Sess. P., 1836, 49, p. 539, encl. 1, in Ds., No. 499.

368 Colebrooke to Glenelg, No. 94.

369 Sess. P., 1836, 49, pp. 506-7, Ds. of May, 1835.

SIR GILBERT T. CARTER, GOVERNOR, BAHAMA ISLANDS, 1898-1904

local justices.[370] Thus was the magisterial establishment cleared of the dead weight of incompetent justices and placed on the basis on which it remained throughout the remainder of the apprenticeship period. From this time forward, all the reports on its operations were almost without exception favorable to its efficiency and its competency to deal with the problem of apprentice labor in this Colony. The difficulty from the beginning had been that on account of the lack of training in the performance of judicial functions, and from identification with local interests, the local magistrates were incapable of performing these peculiar magisterial duties. They were never able to command the respect and the confidence of the employers or the apprentices. Upon these officers depended in great part the success of the system by which the great body of ex-slaves were being educated for the state of freedom. To their disinterestedness, their impartiality, their devotion to duty, and their general efficiency was due the harmonizing of the jarring elements, the preservation of peace, and the prevention of injustice, discontent, disorder, and lawlessness throughout the Colony.

Duties of Special Magistrates.

It was the duty of these magistrates to adjust the disturbed colonial society to the new relations into which its people were entering, and to assist the classes in every way to live up to the regulations imposed on them. The white inhabitant, accustomed to a regime in which implicit obedience to his command was the rule, was unwilling to give cognizance to the changed relations in which the late slave was to have partial command of himself; on the other hand the apprentice was fearful for a time that this change to apprenticeship was not what the King had intended to grant him, and that the local government had leagued itself with the late slave-masters to deprive him of the boon of immediate and complete freedom. Everywhere the magistrates visited, the first and most important duty was to explain the nature of the new relations and to set matters to rights between the masters and the apprentices.[371] There were in many parts absurd conceptions of what the new relations amounted to. This fact was due in no small degree to the prevailing irregularities.[372] The local justices added to, not lessened, the confusion.[373] The officials strove to impress on all classes that the changed conditions were merely a preparation

[370] Sess. P., 1836, 49, p. 516, Ds. of Lord Glenelg.
[371] Sess. P., 1836, 49, p. 532, circular instructions to the special justices.
[372] *Loc. cit.*
[373] Colebrooke to Aberdeen, No. 60.

for further changes in society, that they ought to strictly obey the reciprocal obligations imposed on them, and that their coöperation was necessary to secure the most benefit to themselves,[374] and further "to impress on all parties that the term of apprenticeship was one of probation in which they were to be gradually prepared for the new relations in which they would ultimately stand to each other, and that the best preparation for the change would be a strict observance of the law and the obligations it had imposed."[375] They heard complaints of employers and employees, settled disputes and adjusted differences, the neglect of which might have led to more serious disturbances.[376] They had authority to judge of the point at issue in dispute, between employer and employee, in case of the failure of the parties to agree.[377] These things they did with results that were most gratifying to those interested in the success of the change in progress.[378] They quieted the misapprehensions of all parties, restored order, and won the confidence of the people.[379] To keep the peace and quell incipient disorders, jails and places of confinement had to be erected. As hard labor was much employed as a form of punishment, work-houses were to be supplied. The special justices coöperated with the rate payers in providing funds to pay the cost of materials and of work on these buildings. They appointed constables in every district, who made monthly circuits, received complaints and kept journals of them. These constables were empowered, in extreme cases, to send offenders to Nassau during the intervals between the visits of the special magistrates. Ordinarily these constables were called on to act only when the justices came. They acted for the most part as advisers to apprentices.[380] The magistrates made sketches and surveys of lands in the Out-islands, took account of any features of soil, etc., that might conduce to the formation of settlements. They were members of the school commission and visitors of the public schools. They aided the out-lying communities in erecting school houses and in providing means of education.[381]

Lieutenant-Governor Colebrooke rightly judged that the special justices on their tours would collect much information as to the actual condition of things in the Colony, by which information he could profit in making more

[374] Sess. P., 1836, 49, p. 513, instructions to magistrates.
[375] H. V., 1834-35, p. 190.
[376] Colebrooke to Glenelg, No. 122, Dec., 1833.
[377] Sess. P., 1836, 49, p. 532.
[378] H. V., 1834-35, p. 184 ff.
[379] Colebrooke to Aberdeen, No. 53.
[380] Sess. P., 1836, 49, pp. 512-14.
[381] *Loc. cit.*, pp. 512-13, and 543-45.

efficient the magisterial system, and by working through it the government would be enabled to act with more confidence, concerting measures for the general improvement.[382] Much information was thus collected and reported by these officers. Another duty that became increasingly important with the passing of time was that of the supervision of voluntary agreements between employers and apprentices. In all cases in which the parties could agree on specific terms such agreements were encouraged. In this respect especially did the special justices act as a safeguard to the interests of the apprentices. It was found that voluntary engagements for task work, or otherwise, called forth in the best manner the dormant energies of the negroes and encouraged industrious habits in them. All such agreements had to be voluntary on the part of the apprentices in order to be binding. The special justices were enjoined to see that the terms of all agreements were not unreasonable and that they were fully understood by the negroes, dealing with all parties as freemen.[383] In all things they were urged to use their moral influence to gain the confidence of the people and to promote peaceful interests.[384] They had the power in this, as in other things, to impose penalties on both employers and employees, in order to enforce compliance with the regulations in the abolition laws.

In addition to these regular duties there arose from time to time special duties which it was convenient to have these officers perform. One of these was that of their assistance in the summer of 1835 in the reclassification of the apprentices. This was necessitated by the habit prevailing in many parts of employing praedial apprentices as if they were non-praedials. As the non-praedials were to be freed on the first of August, 1838, a confusion might have resulted as to who were, and who were not, non-praedials. It was necessary to keep the classes of apprentices carefully distinguished. Many of the praedials as well as non-praedials were eager to redeem the unexpired portion of their apprenticeship.[385]

Operations of Apprenticeship System.

As far as this Colony was concerned the British Ministry was not mistaken as to the probable results of the establishment of the special magistracy. The English justices accepted the responsibility that awaited them and established order. They secured such mutual good understanding that disquietude and

[382] Colebrooke to Glenelg, No. 69.
[383] Sess. P., 1836, 49, pp. 534-5.
[384] *Loc. cit.*, p. 517.
[385] Colebrooke to Aberdeen, No. 36.

discontent became exceptional. In fact nearly every report that came in after the first circuits were made gave the intelligence that all classes evinced a disposition to be peaceable.[386]

The able manner in which the English justices disposed of complaints and settled difficulties gave the people renewed confidence in them. Contentment with existing relations and a desire to make the best of them were to be seen on every hand. This aided the magistrates so much that less difficulty was experienced in disposing of complaints with each successive visit. This tended to lessen the necessity of the frequency in the visitation of the magistrates.[387] The sympathetic coöperation of both employers and employees seemed to have been enlisted in keeping the peace and in promoting harmony—convincing evidence of the impartiality of the conduct of the officials.[388] At Exuma before August, 1835, some of the employers were little disposed to promote the interests of apprentices, but expected the same requirements from them as when they were slaves, and did not acknowledge the existence of the new relations.[389] Another report from the same island in January, 1836, noted great improvements, both employers and laborers being much better satisfied.[390] The employers were generally found to be of liberal disposition. This, together with the confidence of the apprentices that the magistrates would safeguard their interests, aided in securing punctuality in the performance of engagements.[391] Masters were mindful of the position in which the laborers were placed. The latter responded appreciatively to the kindly treatment accorded to them. Both came to realize that their individual interests depended on mutual good feeling.[392] All this became the subject of remark by the Executive on every occasion.

Perhaps the most beneficial feature of the apprenticeship system was that of the voluntary agreements between employers and apprentices. After the

[386] See following references for these favorable reports: Sess. P., 1836, 49, pp. 524-31 (Aug., 1835); *loc. cit.*, pp. 543-5 (Jan., 1836), report of the circuit in the latter part of 1835; *loc. cit.*, 1839, 37, p. 487 (12), (Aug., 1838); see also Colebrooke to Glenelg, No. 122 (Dec., 1835); No. 94 (Oct., 1835); No. 50 (May, 1836); Cockburn to Glenelg, No. 3 (Sept., 1837); and No. 56 (Feb. 1838); also H. V., 1835-6, p. 2 (Dec., 1834).

[387] Colebrooke to Glenelg, No. 86.

[388] Colebrooke to Glenelg, No. 122.

[389] Sess. P., 1836, 49, p. 522, report of special justices.

[390] *Loc. cit.*, 543.

[391] *Loc. cit.*, p. 532.

[392] H. V., 1835-6, pp. 73-79. Message of the Lieutenant-Governor transmitting reports of the special justices. Sess. P., 1836, 49, p. 545.

first experiment with them had proved their usefulness, they came rapidly into favor and increased in popularity up to the close of the apprenticeship period. They secured to the master a more punctual performance of the laborer's obligation to him, and on the other hand appealed to the best there was in the negro to bear responsibilities voluntarily assumed. Both parties preferred them. To them was due much of the good feeling that existed between the classes after the summer of 1835.[393] Praedials as well as non-praedials were employed in this way.[394] Complaints to the magistrates were less frequent where agreements were most common.[395] The use of them spread rapidly to all parts of the Colony, as soon as the intelligence of their beneficent results was carried to the Out-islands.[396]

In his instructions to the magistrates in September, 1825, Lieutenant-Governor Colebrooke urged as a leading object of the circuits that they should encourage voluntary agreements with specific terms. They were not to allow agreements whose terms were not equitable. It seemed desirable to reserve two days in each week to the laborer for the purpose of obtaining food and clothing for himself.[397] At New Providence voluntary contracts were entered into, during the autumn of 1835; at Eleuthera at the same time nearly all the proprietors had formed agreements to furnish time and land to the apprentices in lieu of food and clothing.[398] By January of the following year agreements were being successfully employed at Ragged Island, and the laborers there were being paid annual wages for work on the salt ponds on Saturdays; Rum Cay was also employing them.[399] Where this plan was not followed the complaints from all parties were multiplied and the visits of the magistrates were attended with less benefit to the community.[400] Prosperity attended them, and especially did they enjoy peace, a blessing which the Bahamas had hardly known for twenty years. The difficulty of disposing of their produce alone hampered their prosperity.[401]

Another form of engagement was that by which the apprentice bargained

[393] Colebrooke to Glenelg, Nos. 94 and 95.

[394] Colebrooke to Aberdeen, No. 36.

[395] Colebrooke to Glenelg, No. 95.

[396] Sess. P., 1836, 49, pp. 530-31, report of S. Js. Winder and Munro.

[397] *Loc. cit.*, pp. 534-5, instructions to the special justices.

[398] *Loc. cit.*, pp. 524-31, enclosure No. 3.

[399] *Loc. cit.*, pp. 543-5.

[400] Colebrooke to Glenelg, No. 85, Oct., 1835.

[401] H. V., 1835-6, pp. 73-79. Sess. P., 1836, 49, p. 545.

to absolve his obligation to his master for a stipulated consideration.[402] A number of others were released for no pecuniary consideration.

Just before the close of the apprenticeship period, Parliament amended its abolition act with a statute regulating the labor of apprentices.[403] It enjoined certain duties on the employers, gave the governors of colonies additional powers of control of apprentices, and gave the latter a number of additional privileges and exemptions. It was of no considerable importance in this Colony, having been declared in force on May 29, 1838, only two months before the laborers, praedials as well as non-praedials, were finally set free. It might have borne some fruit in vexing the masters in this Colony. As it was, perhaps its principal result was in helping to induce the local Assembly to enact a law releasing the praedials from the unexpired portion of their term of apprenticeship.

Complaints.

The complaints made by the employers and apprentices were mostly of a trivial nature. They were much more frequent at the beginning than after the magistrates had completed the first visitations to all parts of the Colony. They became less and less frequent with each successive tour.[404] As has been stated the formation of voluntary engagements tended greatly to lessen the number of complaints,[405] and the arbitration of difficulties was successful and satisfactory to all.[406]

Punishments.

The special magistrates had the power to require obedience to engagements, and good conduct on the part of all by the infliction of penalties on offenders. The mind naturally reverts to the lash when penalties are mentioned in this connection. We have seen that Parliament prohibited its use for women in the abolition act. It went out of use also for male servants. Lieutenant-Governor Colebrooke soon after his arrival ordered a gradual discontinuance of its use as a stimulus to labor, and the substitution for it of other modes

[402] The total number of instances of this up to Sept., 1835, was 81; the total amount paid for these was £1215 9 s. or a little more than £15 each. Those voluntarily released without compensation during the same period numbered 688; 293 being males and 395 females.

[403] Imp. Stats., 1 Vic., 19.

[404] Sess. P., 1836, 49, p. 532. Also pp. 543-5, on report of circuit, especially that referring to Cat Island and Rum Cay.

[405] Colebrooke to Glenelg, No. 95.

[406] Sess. P., 1836, 49, pp. 524-31, No. 3.

of punishment.[407] The substitutes that were most satisfactory were hard labor in the work house and extensions of time. Fines were employed to some extent and were redeemable by hard labor.[408] The efficacy of hard labor as a means of punishment was early demonstrated by its employment in the work house at Nassau. Colebrooke soon recommended it in other places, as a means of building the much needed gaols.[409] Stocks were used in some places with good effect. The usual labor for women was grinding corn or picking cotton.[410] Towards the close of the apprenticeship period the reports showed marked improvement, by the great reduction in the number of penalties imposed. The magistrates had taken things in hand, and the results of their labors are shown in the reports they made for the district of New Providence, during the last month of the application of the regulations of apprenticeship, viz.: July, 1838, Special Justice Winder gave the report that there was not one case requiring the infliction of a penalty on either employer or apprentice,[411] a report that was unprecedented for that populous district.

Colonel Colebrooke was careful to make known in all parts of the Colony what was occurring in the more peaceful communities. For a time the ignorance as to this, prevailing even at the capital, worked unfavorably to improvement. The head of the government was on the alert on every occasion to make known the favorable condition of affairs. The Nassau people were for a time not disposed to believe that such success, as was reported, was being met with in the Out-islands. The reports were almost uniformly favorable. The dissemination of this intelligence excited the people to emulate the example of

[407] Colebrooke to Glenelg, No. 95.

[408] Sess. P., 1836, 49, p. 531, return for the period July 31, 1834, to October 1, 1835. Total number of apprentices, 10,400; punishments by authority of S. Js., 768; employers' fines, amount £124 8 s. 6 d.; male apprentices whipped, 169; female punishments, 286. Two hundred and seventy-two of these punishments were inflicted at New Providence, and 246 at the Turks Island. *Loc. cit.*, encl., No. 3. The greater number of punishments at New Providence and the Turks Islands was explained by the fact that fishermen and others resorted to these places from other parts, and many offenders were brought to them to be punished. In some islands the offices were open every day to settle disputes, and punishments were fewer in them on that account.

[409] Sess. P., 1836, 49, p. 532, and pp. 543-5.

[410] The most extreme penalty reported was that of a male apprentice named Sam, bound to one Durham, at the Bluff Settlement on Eleuthera. He ran away. A magistrate and three constables advised him to return to service. He refused to return, set the law at defiance, worked on the King's land, and lived with another runaway named Tulip. He was absent for ten months. He admitted all charges and begged for mercy. His penalty was one month's hard labor, thirty lashes and ten months' extension of his term. Sess. P., 1836, 49, p. 537.

[411] Sess. P., 1839, 37, p. 487 (12).

those who were peaceably disposed, in seconding the measures of the government. The effect of it in all parts was salutary.[412]

Reform in the General Court.

At the same time that the reform was taking place in the special magistracy, there was seen to be a need of reform in the General Court. The slave court of the old regime had passed out of existence. The business of the whole Colony of freemen now fell upon the General Court. Its business was increased to such an extent that in its then present condition it was unable to meet the needs of the Colony.[413] The Assembly authorized it to hold four sessions in the year but that had not sufficed to care for all the business that came to it.[414] Complaints also came up from Turks Islands, a disaffected community 500 miles away from the capital, of the inconvenience to their people of the service rendered by the General Court. These people had to bring all cases that were not tried in the Justice's court to Nassau for trial. Communication with the capital was always infrequent, always attended with difficulties and beset with dangers from ocean currents and jutting rocks. The expense of carrying a case to Nassau was too great for the people to bear. For ordinary cases of robbery or larceny it was unreasonable.[415] A journey from New York to Liverpool and back was attended with no less hardship and inconvenience than one from Turks Islands to Nassau and return.

As in the case of the special magistracy, Lieutenant-Governor Colebrooke conceived the idea of establishing circuits for the justices of this court. Assizes would thus be held in all the larger Out-islands. With the concurrence of the Secretary of State he recommended it to the legislature. His plan carried,[416] and a little later the Assembly made provision for the traveling expenses of the justices.[417] According to the arrangement, instituted circuits were made twice annually to all the more important islands. These circuits were as follows: 1, the western, including the Berry Islands, the Biminis, Andros, Abaco, Grand Bahama, and Harbor Island; 2, the middle, including

[412] Colebrooke to Glenelg, No. 94.
[413] Colebrooke to Aberdeen, Nos. 32 and 35.
[414] Colebrooke to Glenelg, No. 112 (1885).
[415] See Colebrooke to Glenelg, No. 17 (1836).
[416] See 5 William IV, 7.
[417] Cockburn to Glenelg, No. 45.

FIG. 1.—VIEW SHOWING GOVERNMENT HOUSE AND GARDENS, NASSAU

FIG. 2.—LANE OF POINCIANAS, GOVERNMENT HOUSE, NASSAU

VIEWS ILLUSTRATING GENERAL CONDITIONS

Eleuthera, Long Island, Rum Cay, Exuma, San Salvador, Watlings and Ragged Island; 3, the eastern, including the Turks and Caicos Islands and Inagua.[418]

Captives from Slave Ships.

A class of persons that caused much anxiety to Lieutenant-Governor Colebrooke was that of the captives from slave-trading vessels. A number of these vessels continued to be brought to the port of Nassau by the wreckers, and by vessels of the royal navy which constantly patrolled the adjacent waters in search of slavers. Colebrooke was zealous to make a drastic crusade against this commerce,[419] but was never able to accomplish more than to add the information that came to his hand from the small Colony in which he was located. He had to be content in his small sphere here with dealing with those captives who were actually brought into the Bahamas. His predecessor had recommended that they should be sent to Trinidad where there was a demand for them as laborers, and where they would still have the advantage of British regulations. There was almost no regular employment for any considerable number of them in the Bahamas except in the raking of salt. In this hard labor there was little opportunity for self-improvement, or for learning the English tongue, which was considered very important. The cruelties practiced by the overseers of the salt-rakers were such that it did not seem desirable to consign these poor people to that employment.[420] In June and September, 1834, two large cargoes of captives were brought into port. Fortunately there was a demand for the services of these Africans among the people of New Providence Island. They were apprenticed for a term of seven years. Their employers were bound to support them, to teach them to work, and to provide adequate instruction for them.[421] It was on the coming of these vessels that Balfour made the recom-

[418] Colebrooke to Glenelg, No. 110. Chief Justice Munnings had grown old and had often within the last few years been a disturber in the Privy Council of the Colony. The failure to secure a promotion for him outside of the Bahamas made him the more discontented. But during the administration of Colebrooke, he departed with his family for a visit to England. The vessel in which he sailed was lost at sea. It was never heard from after its departure from one of the eastern islands of the Bahamas. Assistant Justice John C. Lees became his successor. Colebrooke attempted to have him removed to some other colony. But after a report by him on a circuit to the Out-islands, he recommended him for the Chief Justiceship of the Bahamas, to which he succeeded on the death of Chief Justice Munnings. Colebrooke to Aberdeen, Nos. 32 and 99 (1835).

[419] See his Ds., No. 48, to Aberdeen.

[420] Balfour to Rice, No. 5.

[421] *Loc. cit.*

mendation to the home government to send any others that came to the Bahamas to the colony of Trinidad.

On the arrival of William Colebrooke in the following year (1835), the policy of the local government and its recommendations as to the captives was entirely changed. The new Executive saw throughout the Bahamas large tracts of unoccupied lands (he knew not how unproductive they were) and imagined that they would be suitable for settlements of captive Africans. He attended an inspection of a settlement of these captives soon after his arrival in the Colony,[422] and found out that they were healthy and well provided for. He determined at once to secure as many of these Africans as possible, to have them sent hither from other colonies, if necessary, and to settle them on this vacant Crown property where, he hastily concluded, they could soon provide for themselves after a kindly paternal assistance from the government.[423] Thus would he build up a new class of subjects of his sovereign. He adhered to his hasty conclusions in the face of the decline, under his very eyes, of the settlements at Adelaide and Carmichael, on New Providence Island. He attributed the failure of these two settlements, to the incapacity of the superintendents.[424] Here William Colebrooke would have erected a refuge for unfortunate Africans captured by slave hunters, all unaware that starvation threatened those who attempted to live on these barren lands. He wished also to have here an asylum for decrepit and discharged soldiers, from the West Indian regiments of the British empire.[425] But he was unable to convince the Colonial Secretary of State of the soundness of his views in this respect.[426]

The plan suggested by Colebrooke was to settle these ignorant black men in close settlements on the Out-islands, apparently unthoughtful of the meager refining influences that existed even in the better populated parts of the Colony. Lord Glenelg could not consent to the formation of such settlements where men would not learn the English tongue, nor imbibe English democratic ideas, nor become attached to the British Crown. Colebrooke admitted the desirability of these things but still hoped to win favor for his project. He desired to have the captives brought into the Colony and apprenticed to the inhabitants. He

[422] Colebrooke to Aberdeen, No. 13.

[423] Colebrooke to Aberdeen, No. 18 and No. 51.

[424] *Loc. cit.*, No. 41. He was persuaded that they ought to be able to subsist themselves in such settlements by their own labor. Much work had been done in these two places under the direction of Sir James Smyth to make them desirable places for residence.

[425] *Loc. cit.*, No. 51.

[426] Ds., S. St., 1836, No. 86.

argued that the Bahama apprentices were the most intelligent and the furthest advanced morally of those in any British West Indian colony.[427] He labored to prove that the negroes would be more favorably situated in the Bahamas than in Trinidad, arguing that there was an increased demand for them as salt-rakers and in loading vessels at good wages;[428] that the environment was better in the Bahamas than in Trinidad; that the general comfort and respectability of the Bahama negroes was superior to that of those in the neighboring British colonies; that adult laborers were generally able to make a comfortable living within two years after their introduction into the Bahamas; and that the treatment they would receive here and the homes they would find, would make them into loyal subjects of the King in return for the protection afforded them. The probable cost of settling them would have been inconsiderable, in his view, in prospect of the return for the outlay.[429] Fortunately for the captives, Colebrooke was unable to induce the Colonial Department to adopt his program for these settlements.

Colebrooke had only to deal with those negroes which were brought into the ports of the Bahamas from the neighboring water. But in this way many captives were introduced into the Colony. In March, 1836, the slaver Vigilante, with a burden of 230 negroes, and in April of the same year the Creole with 314, all in a deplorable condition, were brought to Nassau.[430] The cargo of the former was in a dreadful state. Diseased and wearied by the long voyage, many of them were blinded with ophthalmia. All were half naked and they were huddled together in a vessel without a deck, having to make their bed on the hedge poles which protected the yams, that served for their means of subsistence. The latter cargo, made up largely of children, was in nearly as bad condition. Under the orders of the Lieutenant-Governor they were in each case landed as soon as possible, and cared for in such manner as the meager hospitals and other places on the island could accommodate them.[431] After the negroes had been restored to strength they were indentured to the inhabitants, as had been done in the case of those brought in before. The people seemed eager to obtain these docile newcomers as serv-

[427] Colebrooke to Glenelg, No. 25 (1836).

[428] *Loc. cit.*

[429] Colebrooke to Glenelg, No. 39 (1836).

[430] Colebrooke to Glenelg, Nos. 28 and 31.

[431] *Loc. cit.*, No. 43. An attempt was made to prosecute the ships' masters for piracy on account of the atrocious conduct reported of them. The bills were rejected by the grand jury on the ground that they had no jurisdiction over crimes committed on the high seas.

ants.[432] The remnants of another cargo, most of whom were drowned at Harbor Island, came in November, 1837.[433] Two more loads of ghastly looking Africans, numbering in all 1043, were brought in the spring of 1838. Both of these vessels were of limited size. The Africans were cared for in the best manner possible. The people to whom they could be indentured desired to accept them as apprentices only for terms of a considerable number of years. Some difficulty was experienced in the attempt to bind them out for short terms. There were applications for all of them, however, and all were indentured within a few weeks.[434]

The demand for indentured servants at Nassau was almost satisfied. The eagerness to receive them abated. In the early summer of 1838 great difficulty was experienced in disposing of the cargo of a Spanish slaver. Adults were less easily indentured than children. The inhabitants would only accept them on terms that were very favorable to themselves. If set free the newly arrived Africans were not equal to the battle with their circumstances. They could not understand the nature of agreements, and were unable if unaided to gain a living. It was always best to place them in tutelage and under the care of the special justices, in order to prevent them from being imposed on by the public. Those who were able to receive them as servants preferred to contract for a term of seven or fourteen years. Many would not take them for a shorter term. It was more profitable to apprentices, as well as to the masters, to place them out for the longer term. The masters endeavored to teach long term apprentices to be useful and many of them became independent and prosperous after a few years, whereas little interest was taken in teaching those who would soon have to be released.[435] During this summer, also, the failure of Colebrooke's settlements began to throw the negroes in them back on the hands of the government. It became impracticable to place indentures for shorter terms than four years.[436] The necessity of the maintenance of any considerable number of them was avoided by the vigilance of Lieutenant-Governor Cockburn in finding new employment for these people. A few, however, did fall upon the government for a time.

After the cancellation of the praedial agreements the indenturing of this class of Africans was also discontinued. This left some without employment.

[432] *Loc. cit.*, No. 39.
[433] Cockburn to Glenelg, No. 38.
[434] Cockburn to Glenelg, No. 75.
[435] Cockburn to Glenelg, No. 79.
[436] *Loc. cit.*

In the autumn of 1838, all Africans landed from slaving vessels were freed from the obligations of their indentures.[437] The children from a brig that was brought to Nassau were placed in care of the African establishment at Carmichael.[438]

The settlements made for these Africans were not successful. That at Highburn Cay made by Sir James Smyth failed, because of a drouth. Those at Carmichael and Adelaide were declining during the administration of Colebrooke. Another was formed at Headquarters, near the city of Nassau. This was the most successful of any of these experiments. The site of Headquarters, now called Grants Town, was a swamp. The negroes entered it under the supervision of the government, drained it, enclosed their allotments, planted gardens, erected dwellings, and laid out streets and other improvements for the public good.[439] On this site was formed a permanent settlement, the lots being sold to those who occupied them. Preparations were made for a large scheme of settlement wherever the vacant lands of the Colony would admit it. Township sites were selected on the Out-islands. Among the first of these was that at Stirrups Cay, one of the Berry Islands, fifty miles north of Nassau. This place was called Williamstown, in honor of the King; another was called Victoria for the princess. There was much competition for building sites in these places. Colebrooke hoped to persuade the negroes to settle in these places and to establish permanent homes as soon as they were set free.[440] Some of these settlements flourished for a time, but none of them with the exception of Grants Town has had any considerable permanent importance in the Colony. They generally declined after a few years. Some of them have, however, become the sites of the small towns on the Out-islands. There has been no continuous prosperity in the Colony that would warrant the building of towns. Bennetts Harbor at San Salvador, the Harbors at Rum Cay and Ragged Island, at the Bight and Great Harbor at Long Island were among these town sites that were selected at this time.[441]

[437] Cockburn to Glenelg, No. 119.

[438] *Loc. cit.*, No. 134. Cockburn received an instruction to the effect that he should use all means in his power to secure the cancellation of these agreements, but did not understand it as applying to the captives. A little later he received more definite instructions and proceeded to give the order for the cancellation of these indentures. *Loc. cit.*

[439] Colebrooke to Glenelg, No. 72.

[440] Colebrooke to Glenelg, No. 125.

[441] Sess. P., 1836, 49, pp. 543-5.

Relations of the Branches of the Government.

The transition from slavery to apprenticeship in the Bahamas was accomplished without any considerable disturbance. In some places the negroes had refused to work until the coming of the magistrates, when the new relations were explained to them. The coming of these officers proved a cure for all ills of this kind. Quiet was restored. It was now known that slave property was annulled, that compensation would be received for it, and that any efforts this little Colony could make could not alter in the least the working out and attainment of the object at which the home government was aiming. Four years were left to the people in which to employ their laborers without other remuneration to the latter than that of subsistence. It was to the advantage of those who had owned slaves to make the most out of the services of apprentices, while the opportunity lasted.

The spirit of the slave owners was conquered. They had resisted, standing on their inviolable "constitutional rights" of Englishmen, until Parliament gave the death-blow to their "right" to hold slaves in British territory. Now that continued attempts to resist could effect no longer a postponement of the evil day, they determined to comply with the wishes of the home government in the regulation of the apprenticeship system. Their most liberal concession was that by which they provided that the King might disallow any part of their statute regulating apprentices, without impairing the other parts of the same act.[442] The objectionable parts could thus be annulled without destroying the act itself. The Assembly also complied with the recommendations of the Secretary of State for amending the auxiliary act, and passed other laws such that early in the summer of 1835, the Secretary of State was able to admit that "satisfactory provision had been made by the Bahama government for carrying out the intentions of His Majesty's government" in the abolition.[443]

Although this compliant spirit prevailed for a time, there were still smoulderings of resentful opposition to the progress of the measures of the government. These feelings were shared by the members of the opposition party in the House of Assembly and were supported by a faction at Nassau. A newspaper published by a young American furnished an outlet for the expression of the views of this faction. This party seemed to be unwilling to believe that any measures of the home government, for the improvement of social conditions in this Colony, could operate successfully. The members

[442] 4 William IV, 21, last section.
[443] Ds., S. St., 1835, No. 26.

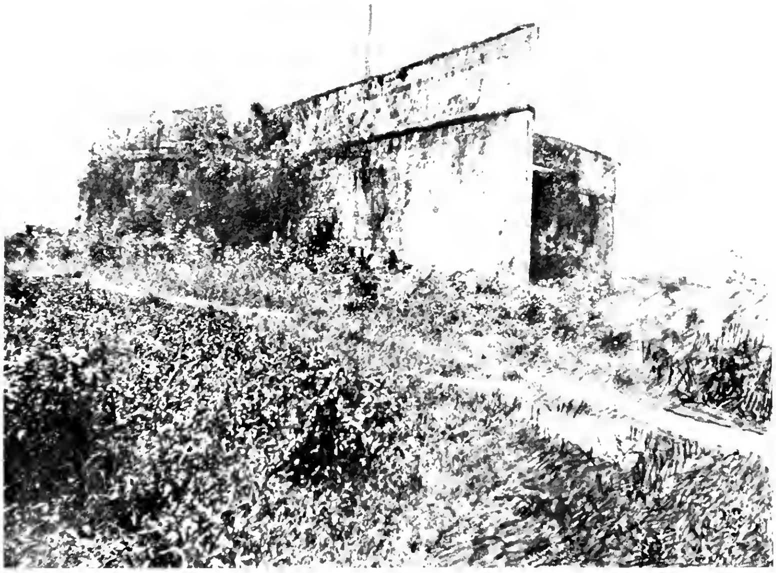


FIG. 1.—VIEW OF FORT FINCASTLE, NASSAU

FIG. 2.—VIEW OF ENTRANCE TO A NASSAU ESTATE

VIEWS ILLUSTRATING GENERAL CONDITIONS

of it at first distrusted the special magistracy. There was for a time a total ignorance at the capital as to the state of things in the Out-islands. Before the return of the special justices from their first circuits, this disaffected faction attempted to take advantage of this ignorance to bring the government into disfavor with the people. For a time none could contradict the charges they made. Such conduct was unfavorable to the progress of the reforms, and of government measures in the Assembly.[444] Even after the report of favorable conditions came, this faction continued to represent things as unfavorable, in order to place the government in a bad light.[445] The members of this party were jealous of the class just rising from the condition of slaves, in which they had wished to keep them. Lieutenant-Governor Colebrooke saw among them what he called the spirit of Americanism, a lack of reverence for royalty and of attachment to the mother country, which he attributed to the frequency of communication with the States.[446]

The House of Assembly sitting at this time was that which had been elected in 1834, before the abolition took effect. A considerable portion of the constituency existing in 1835 had had no voice in the election of this body, a fact which caused no little dissatisfaction both on the floor of the House and outside of it. In its membership were four gentlemen of color who had sat through its deliberations without menace to public interests. A few members, chief among whom was Charles Rogers Nesbitt, favored government measures and generally succeeded in carrying them through the House. Speaker Meadows and a number of others were of the opposition, some of them almost violent against the government. Still other seats were occupied, or at least controlled, by the merchants of Bay Street at Nassau. These inclined to the opposition.[447] Besides these there was a violent member sitting for the Turks Islands, who was a disturber and an opponent of the amelioration measures.[448]

[444] Colebrooke to Glenelg, No. 94 (1835), and No. 10 (1836).

[445] *Loc. cit.*, No. 10.

[446] *Loc. cit.*, No. 10.

[447] Colebrooke to Glenelg, No. 10. The elections in some of the Out-islands were nominal. In some of these only a few electors would assemble to vote and the poll was easily controlled. In closer settlements the poor inhabitants were dependent on the merchants for their necessaries and were generally indebted to the latter, who could control their votes.

[448] Colebrooke to Glenelg, No. 10 (1836). This man, Henshall Stubbs by name, was the only considerable employer of labor at the Turks Islands who refused to make voluntary engagements with his apprentices. He was reported to have been constantly in disputes with the magistrates.

The spirit of the opposition was "inimical to the changes in progress." [449] The Council, with the exception of one or two members, was in favor of the program of the government.

A session of the Assembly which began in the autumn of 1834, under the administration of Balfour, continued until after the coming of Colebrooke, in February of the following year. In March, 1835, the House of Assembly incorporated in its appropriation bill an item of £2225 as remuneration to Henshall Stubbs, the member from the Turks Islands, on a claim for service rendered with a private guardship at the Turks Islands, during the agitation over the abolition of slavery.[450] The claimant voted in his own behalf and the appropriation bill was carried in the House by a majority of only one vote. On account of the presence of this item the Council rejected the whole appropriation bill. A sensation was created in the House by this vote. To prevent a difficulty the Lieutenant-Governor prorogued the Assembly for a few days. A new session began within a few days afterwards. No serious interruption of business was caused by the prorogation and the effect of it on the House was salutary. The members became milder and received government recommendations with more favor than before.[451] But in this session one of the first things to come up was the appropriation bill including the claim of the Turks Islands member. The amount of the claim had now been reduced to £900. The Council, although disposed to reject the bill again, passed it and it received the assent of the Executive.[452] The Council did not adjourn without placing on record a resolution that it would pass no more such claims for public services unless they were preferred through the Executive. The bone of contention was removed. The Assembly was prorogued without further breach of relations, but the feeling in the House was not such as to promise careful consideration to proposals at the next session.

[449] *Loc. cit.*

[450] H. V., 1834-5, p. 130, report of the committee on this claim. There had been excitement and insubordination at the Turks Islands in the year 1832 when all were expecting action by Parliament on the slave question. The slaves were not easily controlled. Many of them were eloping from Grand Cay. There was little hope of securing aid from Nassau to put down the insubordinate. Stubbs offered to employ his own vessel, equipped and manned by himself, on condition that the inhabitants would certify that the vessel was needed to preserve the peace. Thirty-seven persons, five of whom were magistrates, agreed to certify to his claim. Stubbs fitted out and manned his vessel and did guard duty from April 11, 1832, until March 6, 1834.

[451] Colebrooke to Aberdeen, No. 26.

[452] Colebrooke to Aberdeen, No. 64.

The Assembly met again in December, 1835. Thus far the government had been able to counteract any opposition that had arisen in the popular body. Tranquillity continued to prevail in all parts of the Colony according to reports that came to the capital. The intelligence of this acted favorably on the people. It was not without effect within the halls of the legislature. But little of it supported the contention of the opposition as to the success of the apprenticeship system. At the opening of the session, the Executive refrained from making reference to anything that might distract the members from attention to the public interests. Nothing was done to arouse the opposition. But the discontented could not act with equanimity of mind from the very beginning of the session.[453] Things without and within disturbed them. Soon after the meetings had begun, an American brigantine, whose masters were charged with piracy, was brought into port.[454] As the Vice-Admiralty Court could not meet for trial of the prisoners until February, 1836, a bill was passed in the legislature to permit them to be tried at once without incurring the expense of supporting them for almost two months.[455] The judicial proceedings were followed with interest by the people. The members of the Assembly were no less stirred up than the rest of the community. Troops had to be employed to guard the prisoners.[456] A proposal to repeal the clause in the militia act, which forbade the enrolment of the blacks in the service, was rejected by the House after an animated discussion.[457] A bill for improvements in the administration of justice was thrown out on the second reading.[458] A very popular education

[453] Colebrooke to Glenelg, No. 10 (1836).

[454] *Loc. cit.*, No. 120 (1835).

[455] Colebrooke to Glenelg, No. 4 (1836). There were 176 persons under the charge of piracy. It did not seem unwise to dispose of their case as soon as possible.

[456] *Loc. cit.*, No. 13.

[457] H. V., 1835-6, 53, resolutions passed on this occasion. Located as the Africans were in the Colony in settlements almost entirely removed from the other inhabitants and at a distance from any power to control them, this together with the probability that more of them would arrive at any time from Africa caused the majority in the House to think that "an act to prevent the enrolment of them in the Colonial militia," was desirable. There lay in the removal of it too much danger to the public peace. The House professed to be willing to facilitate the enrolment of the militia, but not in this manner.

[458] Regarding this action of the House, the Lieutenant-Governor wrote: "That the bill for the administration of justice was not allowed to go into committee may be ascribed to the clauses it contained for preserving the jury trial and the constitutional objection I maintained to any abridgment of the right of the subject to trial by jury which the House has shown a disposition to abridge since the recent changes in society." Colebrooke to Glenelg, No. 10 (1836).

bill was passed by a majority of four after a strong opposition. A proposition came up to appropriate money to pay the expense of the trial of the pirates. A minor item in it was objected to. The whole bill of expenses was at once rejected by a resolution which declared that the Receiver-General had acted illegally in paying it.[459] Excitement in the House was growing. Taunts were thrown out to the Council for its yielding on the appropriation bill in the previous session. The sensation produced in the Council by the reckless course of the House caused the Lieutenant-Governor to see that any longer continuance of this conduct could only cause greater dissatisfaction and that the opposition would gain strength by it. The fractious member from the Turks Islands declared, on the floor of the House, that the members then sitting did not represent fairly the constituencies as they then existed, and that an appeal to the people should be made. The Lieutenant-Governor acted upon the suggestion, dissolving the House near the last of January, 1836.[460] The dissolution seemed to be at the time chosen for it by the House itself. The Council concurred with the Executive in the move. It seemed likely that an appeal to the people would show that the opposition was a minority in the Colony.

A serious breach in the relations of the two branches of the Assembly was averted by the timely action of the Executive. Relations had not been cordial during two or three sessions, but now the House was wrought up to such a state of excitement that any violent proposal against the Executive would have received heedless support from the opposition. Under such conditions an exercise of the prerogative was desirable. It was important also to give to the class just emerging from slavery an opportunity to reflect upon the responsibilities which they would soon be called upon to discharge, in voting for legislators.[461]

Another Assembly was called as soon as the forms of an election could be gone through. The results of the dissolution were manifest in the better spirit with which the new body applied itself to legislating for the interests of the Colony. More enlightened counsels prevailed. Liberal militia and education bills were passed, and provision was made for the incorporation of the Turks Islands.[462] The administration of justice was reformed, improved regulations

[459] *Loc. cit.*, No. 10.

[460] *Loc. cit.* Also H. V., 1835-6, pp. 138-40.

[461] Colebrooke to Glenelg, No. 53 (1836).

[462] The act for this purpose was disallowed in the following year, H. V., 1837, 288.

were made for contracts between employers and laborers and for praedial apprentices, and prison discipline was mollified.[463] The leaders in this body were active and public spirited. They coöperated with the government in measures for the public good. It was gratifying to Colebrooke that the liberated had thus been "called into a political existence, and a perception of their real position and importance in the community of which the other classes as well as themselves (had) remained in a great degree unconscious."[464] The electors and those who were sent to the new House were disposed to promote measures favorable to the public improvement.[465]

Termination of Apprenticeship System.

The special magistracy continued in its effective control of the apprenticeship system. The corps of six magistrates was sufficient to attend to all the business of the Colony, to preserve order and to promote harmonious relations between the classes. The zeal of the magistrates to give justice to all classes was such as to inspire and renew confidence in them. They were reluctant to allow the infliction of corporal punishment, except in cases where no other form of punishment would suffice. In this respect a greater amount of discretion was allowed towards the close of the period. This was almost the sole change that was made in the system as instituted by Lieutenant-Governor Colebrooke.[466] The efficient management by the magistrates tended to lessen the need of their presence as regulators. A reduction in their number was suggested. The establishment was a costly one for this small Colony to support with the narrow basis on which it depended for its revenues. This fact alone was sufficient in the minds of the local legislators to warrant its reduction.[467] Cockburn was unfavorable to the reduction, unless some other officials than the ordinary justices of the peace could be looked to to assume the functions of protectors of the praedials.[468] Quiet continued to reign throughout the

[463] H. V., 1836, p. 315-17. Also Bahama Statutes, 6 William IV.

[464] Colebrooke to Glenelg, No. 52 (1836).

[465] *Loc. cit.*

[466] Cockburn to Glenelg, No. 66.

[467] The cost of the six magistrates was £2700 annually. Cockburn to Glenelg, No. 56.

[468] *Loc. cit.*, No. 56. Cockburn thought if a reduction was made in the number of these officers two or three should be retained, and the duties assumed by the ordinary justices. This he thought might not prejudice the interests of any class. This would serve to bring the negroes to look for protection to the same officers to whom they had formerly looked before the abolition.

Colony. The apprentices were contented under the regulations as the special justices applied them. The spirit of industry increased. Many apprentices had become independent, the striving for the attainment of which condition had become a great stimulus to them. The near approach of the day when the praedials were to be released caused no demonstrations of anxiety. All reports were most favorable to the good conduct of the laborers.[469]

But as the end of the term of the apprenticeship of the non-praedials approached, certain elements in the population of the mother country began an agitation for the release of the praedials by action of Parliament. A memorial was presented to the House of Commons setting forth as facts many things that were not true at all, of this Colony at least, and praying that final action be taken by that body to release the praedials from the remaining two years of their bondage.[470] The Ministry made a reply declining to take the lead in making any such recommendations to Parliament.[471] But the Secretary of State for the colonies made enquiry of the Lieutenant-Governor as to the probability of the local legislature enacting the desired release of the praedials. The state of opinion in the Bahamas, following upon the deep wound of the abolition, was such that the auspices were unfavorable to the introduction of this measure into the local legislature. In addition to this, all parties were so well contented with the existing relations that it seemed unjust to the owners of praedial labor to obtrude a measure to deprive them of it.[472] Cockburn regarded the introduction of this measure as unnecessary.[473]

Nevertheless the question was brought up in the mid-summer session of the legislature in 1838.[474] The House of Assembly elected in 1837 was under the control of the opposition.[475] The Speaker of the House was also of the opposition faction.[476] There had been several resignations from the House,

[469] Sess. P., 1839, 37, p. 487 (12-14).

[470] Sess. P., 1837-39, 49, pp. 6-8. Petitions to the same effect signed by 600,000 women were sent to Parliament.

[471] *Loc. cit.*, p. 6.

[472] Cockburn to Glenelg, No. 5 (1838).

[473] *Loc. cit.*, No. 68.

[474] *Loc. cit.*, No. 84. See also Sess. P., 1839, 37, p. 487 (9).

[475] On the departure of Colebrooke from the Bahamas, President Hunter, of the Council, had administered the government until the arrival of Cockburn. He dissolved the legislature and called another. Cockburn to Glenelg, No. 86.

[476] Speaker Meadows was formerly violent in his opposition to the government. He was appointed to the chairmanship of this House without opposition. In 1834 he was the mover of the resolution to censure the Council which became the occasion of the dissolution of the Assembly by Balfour. He introduced the measure in 1836

and the elections to fill the vacancies had resulted in favor of the opposition. The then recent amendment to the imperial abolition act,[477] granting rights to the praedials and additional powers to the governors of the colonies, was unpopular among the employers of praedial labor. It was repugnant to them to be subjected to additional regulations from home.[478] Some of the members of the House were doubtless influenced by these new regulations to vote for the release of the praedials, when the matter was presented to that body. The friends of the government were active to strike objectionable provisions out of the original bill, and to make it as favorable as possible to the emancipated classes. Finally on July 2 the Executive was notified that the bill had been passed. On the 3rd of July the two houses were called into the presence of the Lieutenant-Governor, who was there to sign the bills to which he would give his assent. A very irregular proceeding occurred. The Speaker of the House, with the concurrence of his colleagues, arose and in a confused manner read a long address, calling in question the right of the imperial Parliament to legislate for the colonies, and arraigning the representative of the Queen for his conduct in dealing with the apprenticeship question.[479] This was a last expression of the long-confined feelings of the late slave owners, perhaps intended for a revenge against the prerogative for fancied wrongs against the rights of the people. As soon as opportunity was allowed, the astounded Executive signed the bills and dismissed the assemblage. The business of the session was allowed to proceed without interruption by the government. The House tendered its presiding officer a vote of thanks for his compliance with its wishes, and hastened to strike from its journals a minute stating that his conduct was not concurred in by its members. The Lieutenant-Governor was urged to dissolve the House at once, as a mark of disapprobation of irregular conduct. Cockburn preferred to await an authorization from the Colonial Department at London

that led to the dissolution by Colebrooke. In 1837 he took active part in the measures that led to the dissolution by President Hunter. His career in the Colony had been begun in the commissariat, from which Sir James Smyth had dismissed him for his conduct in the treatment of a gang of slaves while acting in the capacity of agent for an absent proprietor. From that probably arose the opposition which he so actively followed against the government. He had been quiet on the coming of Cockburn, but it was not long before his unbecoming conduct brought his colleagues into difficulty. Cockburn to Glenelg, No. 86. Meadows was appointed to the Legislative Council after the separation of the Councils.

[477] Imp. Stats., 1 Vic., 19.

[478] Cockburn to Glenelg, No. 86.

[479] Cockburn to Glenelg, No. 86. This speech also contained some remarks about the abolition act of Parliament.

although convinced of the expediency of an early dissolution.[480] In the early part of the following year this body was sent back to the people who had elected it, in order to secure another expression of their will.[481]

The praedial apprentices were now released from the unexpired portion of their term of apprenticeship.[482] Old and infirm persons now coming free were to be supported at the expense of the State unless otherwise provided for.[483] In order to prevent the praedials and others from being thrown upon the public without homes, two months notice was made necessary before an ejectment from rented property could be forced. But there was no general disposition to take advantage of the negroes in any such way. August 1, 1838, passed by with no demonstrations of insubordination on the part of the class which was coming into command of itself. The harmonious relations that had existed since the latter part of the year 1835 continued to prevail.[484] The employers and men acted in the best spirit. Content with their relations since the abolition, the negroes wished to continue in the service of their former employers, and the latter were disposed to enter into relations for mutual benefit.[485] In addition to this, the indentures of the Africans were cancelled in the autumn of this year (1838). The last of bonded labor as a general system was done away with in the Bahamas. It had long been in existence here. Henceforth the affairs of the Colony concern freemen. In the next chapter it will be necessary to show how the progressive spirit of English nineteenth century politics dealt with the negro as a freeman, how unceasing were the efforts made to educate him and to further ameliorate his condition, by introducing into his very being the seeds of civilization, of morality, and of economic well-being.

THE PERIOD 1838 TO 1848.

The Opposition Party and the Government.

The numerous contests with the Assembly during the last decade were not calculated to produce harmony between the government and the House of Assembly. The small number of those who were likely to be elected to seats in

[480] *Loc. cit.*

[481] Cockburn to Glenelg, No. 14 (1839).

[482] 2 Vic., 1.

[483] *Loc. cit.* Also Sess. P., 1839, 37, p. 487 (12).

[484] Cockburn to Glenelg, No. 96. Sess. P., 1839, 37, p. 487 (12).

[485] Sess. P., 1839, 37, p. 487 (14). *Loc. cit.*, p. 12, report of S. J., for New Providence.

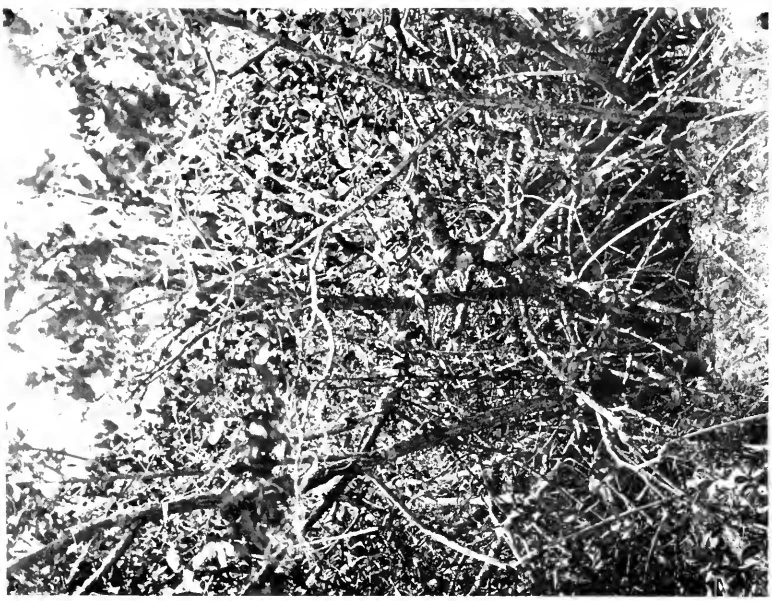


FIG. 1.—VIEW OF MANGROVE THICKET, NEW PROVIDENCE

FIG. 2.—SCENE AT MOUNT VERNON, NEW PROVIDENCE

VIEWS ILLUSTRATING GENERAL CONDITIONS

the House made it almost inevitable that each House of Assembly would have in its number some persons who had sat in former Assemblies. Thus in 1838 there were members of much influence who had sat through all the stormy sessions of the House since 1830. Some of these had been leaders of the opposition faction. This party had acquired the habit of unqualified opposition in all its contests with the government. Some of its members had voted for the release of the apprentices. It now formed a majority in the House, and had no disposition to consider favorably any measure that the government might propose. Its members made harsh accusations against the government [486] during the session that occurred in the autumn of 1838. The Lieutenant-Governor had long been convinced that a reference to the people would be expedient. He acted very deliberately, however, preferring that it should be known that the anticipated dissolution had been authorized from London instead of from the Government House at Nassau.

The House of Assembly sat and stormed. The land question came up. The government proposed a measure to prevent the unauthorized occupation of the Crown lands of the Colony.[487] The bill was modeled after an Order-in-council that had been issued for the Crown colonies. After a heated discussion of its merits and demerits it was rejected. Some members of the opposition took occasion to express want of confidence in any measures the government might propose for passage. It became evident that the carrying out of the views of the government must depend on the issue of a new election. The majority were expressly hostile to the government program. Relations between the government and the House were at their worst, and the time was ripe for an improvement of them.[488] Any longer delay would have given weight to the accusations made by the opposition, as it would have appeared to be overlooking past misconduct. The dissolution occurred early in 1839. This step was taken with anything but haste. Francis Cockburn had been urged to pursue this course six months earlier. He preferred to consider well the results that might be expected to flow from it. The House on its part grew more violent with every step, so violent that it was no longer doubtful that it ought to be dissolved.

The business of the Colony demanded the attention of the legislature.

[486] Cockburn to Glenelg, Ds. of Dec. 22, 1838, Misc. Letter Book of Governors, 1838-50.

[487] Cockburn to Glenelg, No. 5 (1839).

[488] Cockburn to Glenelg, No. 5 (1839).

The act granting the salary list was to expire at the beginning of the following year, the regulation of the relations of masters and servants required a new adjustment, and, most important of all, the Colony was face to face with the duty of educating the ignorant among its population. Another attempt at legislation must be made for the sake of these and other interests. Writs for a new election were issued without delay. It seemed likely that a majority favorable to the government would be returned. It was certain, however, that the opposition would make an attempt to seat as many members as possible. There had been a difficulty in former elections that men of respectability, who were favorable to the government, refused to offer themselves for seats in the House. This was not true at this election,[489] but there was a regrettable lack of zeal for candidates whom the Lieutenant-Governor desired to see elected.[490] Much influence was exerted in this election by the control of the salary list. The issue of the contest was not certain. Public officers drawing salaries from the local government were deterred from taking active part in behalf of government candidates by the fact that the Assembly had power to diminish their incomes. In the previous year the House had reduced the salary of the Provost Marshal £100 without previous warning, and, had the Council or the Lieutenant-Governor interfered, the whole appropriation for the year would have been rejected. The Surveyor-General had not received a salary for several years.[491] Other officials were extremely reluctant to give support to persons known to be in favor of government measures. Violent but groundless accusations were made against the representative of the Crown. It was alleged that the sacred ordinances of religion had been prostituted to subserve the political interests of the government. Objection was raised to the voting of Africans whose indentures had been lately cancelled. It was questioned whether they should be placed on an equal footing with the discharged apprentices.[492] Attempts were made to turn the liberated Africans against the government, and to induce them not to support candidates who would be likely to vote for government measures in the coming sessions of the legislature. A hard contest was fought at Nassau. One, John Pinder, who had advocated the claims of the Africans for naturalization, was strongly opposed by this party. Pinder was held up as an enemy of the negroes. The latter, however, voted

[489] Cockburn to Glenelg, No. 9 (1839).

[490] *Loc. cit.*, No. 20.

[491] Cockburn to Glenelg, No. 20.

[492] *Loc. cit.* This despatch intimates that they had been allowed to vote.

for their benefactor and he was elected.[493] The Turks, Crooked and Acklin Islands, all of which had formerly been dominated by the opposition, now returned government members.[494] The election resulted in an almost equal division of the membership of the House between the government party and the opposition. Among those sent up were several individuals belonging to the military forces stationed at Nassau. They were generally Englishmen and favorable to the government policy. In this instance they helped to make up what became eventually a bare majority for the government party.[495]

Election of Speaker.

The legislature was convened on May 6, 1839. The opposition voted for the reëlection of the Speaker of the last House. Opposed to him was the Attorney-General, George Campbell Anderson, who had been a staunch advocate of government measures for several years preceding.[496] A great interest was taken in the contest. It was reported to the Lieutenant-Governor that a ballot had been taken and that it had resulted in a tie vote. Each party persisted in support of its candidate.[497] The Executive declined to interfere. He wished to avoid the appearance of doing anything that was irregular, since, in the sensitive state of opinion in the Colony, many were seeking every opportunity to make complaints against his conduct. When it appeared that different results were not forthcoming, Cockburn prorogued the Assembly for a month in order to allow time for reflection as to the course he should pursue. It appeared that the deadlock would continue and that the ultimate choice would lie with him. But in the interval of the prorogation, one of the members of the opposition sailed for England. This led to the solution of the difficulty. The House met again at the appointed time and elected Attorney-General Anderson as its Speaker.[498]

Hitherto no objection had been made to the presence of the military men

[493] Cockburn to Glenelg, No. 14 (1839).

[494] *Loc. cit.*, No. 20.

[495] Cockburn to Normanby, No. 11. The elections to vacant seats after the opening of the sessions of this House resulted in the return of government members. *Loc. cit.*, No. 21.

[496] Anderson had been a supporter of the government since he had come to a position of influence in the Colony. He was appointed to the Executive Council in 1841. At this time he began his services as Speaker of the House in which position he continued for twenty-six years. He retired from the place with great honor on the occasion of the disendowment of the Anglican Church of the Bahamas.

[497] Cockburn to Normanby, No. 2.

[498] *Loc. cit.*

who had been elected members of this House. There was no colonial law nor any regulation to prevent them from sitting in the House if elected. These men had been freely elected by the suffrages of the qualified voters; they were subject to the same qualification oaths as to property, etc., as the other members; some of them had been in the Colony for many years and had become property holders and were certainly not ill-qualified to sit in the legislature.[499] Custom in the colonies seemed to favor allowing them to hold seats in a colonial legislature. Attempts were made by the opposition to secure their votes against the government, failing which it was charged that their election was a wrong against the people. The opposition seized upon their presence in the House as the cause of its own defeat in the speakership contest and objected to their retaining seats. It was now charged that undue influence had been exerted to bring about their election.[500] The Executive had already begun to present the government program for the business of the session when a motion was made for the unseating of the military members. The latter withdrew during the consideration of this question, but there was still a majority of the House in favor of their retention of the seats to which they had been returned.[501] After this disappointing vote, the jealousy of the discontented members was shown by their attempts to obstruct legislation and to hinder the progress of business. They were unable to cause serious concern to the government during this session. The opposition was now defeated. It had kept up the feeling against the representative of the Crown since Sir James Smyth had first broken with it in 1831, it had hindered business, had impeded the changes that were being made in society, and had always been tenacious in clinging to and claiming constitutional right and privileges which neither King, Ministry, nor Parliament would recognize as belonging to the Colony. It had gone so far, in many instances, that it was no longer popular with the majority of the people. Several of its prominent members had emigrated, others had become reconciled to the changes and had become supporters of the government. A minority remained to contest with the government. From this time we shall find an improvement in the character of the relations existing between the government and the Assembly. Opposition did not cease, but for several years the situation was within the grasp of the Governors and their leadership

[499] Cockburn to Normanby, No. 12.

[500] *Loc. cit.*, No. 11.

[501] *Loc. cit.*, No. 12. The return of Lieutenant Nicolls, sitting for Watlings and Rum Cay, was found to be irregular. Writs were issued for a new election in that district.

was followed in legislation. The results of this dissolution on the politics of the Colony were far-reaching.

Government Prevails.

The margin of the majority in the House was narrow. In this June session the disaffected members voted against almost all measures that were not of their own finding. Bills for the regulation of masters and servants, for the prevention of vagrancy and the unauthorized occupation of land, and for placing the control of the militia in the hands of the Governor, were passed only by the casting vote of the Speaker.[502] The absence from his seat of one member of the majority would have blocked its way in legislation. A fear that such would be the state of things seized upon the Lieutenant-Governor before the beginning of the next session in December, 1839. Charles R. Nesbitt, the leader of the government party, was absent from the Colony.[503] His leadership was needed in presenting the measures of the government, if the turbulent party was to be kept under control.[504] The importance of his presence was so great, in the mind of the Lieutenant-Governor, that he delayed convening the legislature as long as it would not cause inconvenience to the public interests,[505] awaiting Nesbitt's return.

One of the most vital questions at issue was that of the control of the civil salary list. This Colony was always reluctant to vote freely on appropriations for public purposes. The number of years for which any annual payments were guaranteed was always guardedly limited. Salaries had been relegated to the list of expenses regularly provided for in the annual appropriation bill. There they could be reduced or otherwise changed at the whim of the House of Assembly. This was a thing that was manipulated arbitrarily to suit the occasion that offered. The almost absolute certainty that such use would be made of it, that salaries would be scaled down and the incumbents of office be made to feel want, had become a menace to officials and a spur to them to

[502] Cockburn to Normanby, No. 12.

[503] Nesbitt was in England at the time. Cockburn had the utmost confidence in him as a supporter. He had asked the Secretary of State to confer with him during his stay in London, to regard him as a thoroughly reliable witness as to the conditions existing in the Bahamas, and to accept what he might say as indicating the views of the local government. After the elevation of Anderson to the Speaker's chair, Nesbitt had become the member on whom Cockburn relied. His leadership, no less than his vote, was needed.

[504] Cockburn to Normanby, No. 36.

[505] *Loc. cit.*, No. 36, and Cockburn to Russell, No. 5 (1839).

govern their conduct in accordance with the prevailing temper of the majority in the House of Assembly. The management of it was as unscrupulous as it was vexatious. Its effects were manifest in the election that had just passed, and no less in others before this one. It also became a factor in determining the attitude of members of the House who were officials, towards measures that came up for consideration. For five years, however, the imminence of this danger had been removed, as a result of the grant of salaries for that period obtained by Balfour in 1835.[506] Francis Cockburn now desired to have such a vote again, and if possible to secure the grant for the whole reign of the Queen.[507] He had almost accomplished his object when the defection of two members of the House, on whose support he had relied, defeated the plan and made the grant for only seven years.[508] The matter was not allowed to rest with this. During the same session Cockburn applied for and secured an amendment by which the grant was changed from seven years to the whole reign of the Queen.[509] This seems to have been an example of confidence in the Crown that was almost without precedent in the British West Indies.[510] There was no longer any immediate anxiety as to the control of the salary list.

Separation of the Councils.

The nucleus of the support received by the Executive of the Bahamas from the colonial people, lay in the Advisory Council. In all the struggles with the local people during the previous twenty years this body had stood with the Executive with few exceptions. It was often a lukewarm support that some of the members gave, and there was sometimes a determined minority of the opposition in it. It usually acted in harmony with the wishes of the Governor, with whom it was closely allied in the affairs of government. After it had been remodeled by Sir James Smyth it had become a source of strength to the government. In this Colony one body of men had acted as a Legislative Council and as a Privy (Executive) Council to the governor, its members being thus excluded from the membership of the House of Assembly. It was a custom to appoint to seats in the Council men of the first rank for moderation and general worth. There were two vacant seats in the Council in

[506] Balfour to Rice, No. 43. The Assembly had been compliant during that year.
[507] Cockburn to Russell, Nos. 5 and 8.
[508] *Loc. cit.*, No. 8.
[509] *Loc. cit.*, No. 15 (Feb. 14, 1840).
[510] *Loc. cit.*

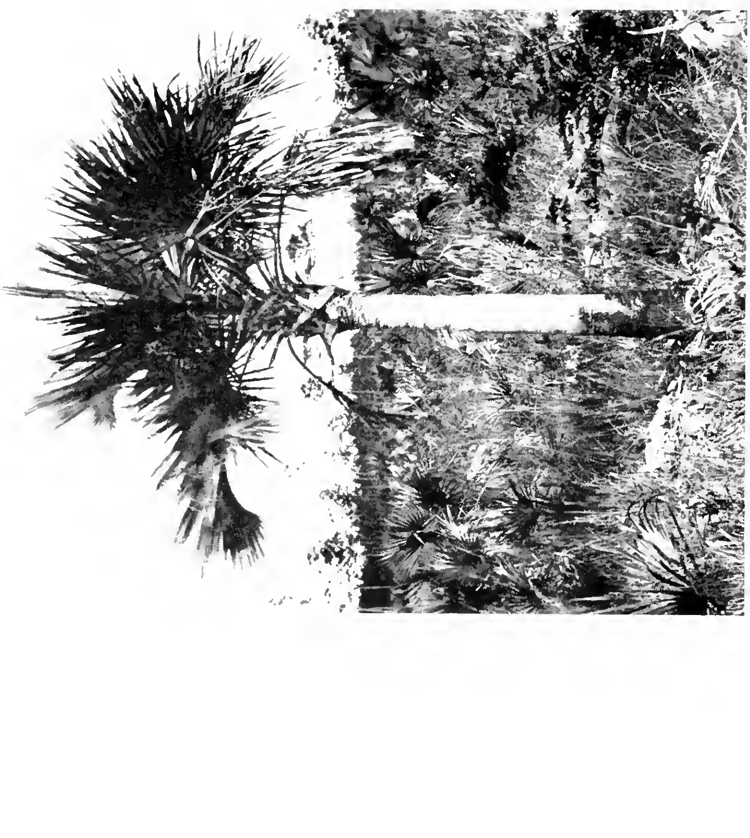


Fig. 1.—THATCH PALMETTO, NEW PROVIDENCE

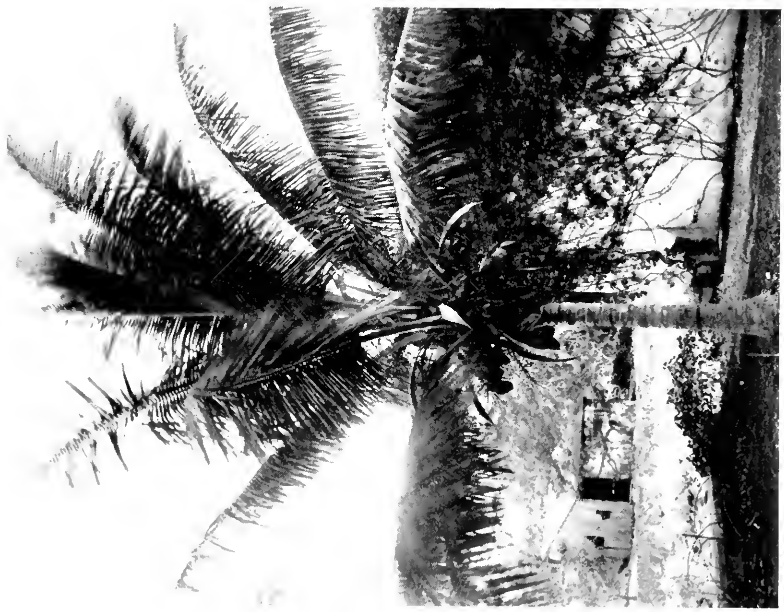


Fig. 2.—COCOANUT PALM, NASSAU

VIEWS ILLUSTRATING GENERAL CONDITIONS

1840 and another was vacated by the death of the senior member, John Irving.[511] There were two men in the House of Assembly whom Cockburn desired to have in his Advisory Council. These were Charles R. Nesbitt and George C. Anderson. They would have to resign their seats in the House if they should accept seats in the Council. Cockburn applied to the Colonial Department for a separation of the Councils, vesting the legislative functions in one body and the executive functions in another, as had been done in other colonies.[512] Under this arrangement he could have the two members of the Assembly as advisors, while they retained their seats in the House. Thus would he have in the House men who were closely identified with the government, and that body would be the more easily controlled.[513] Instructions were accordingly sent during the following year by which the executive functions of the Council were vested in one body of men and the legislative in another. The maximum of membership in each Council was fixed at nine members, three of whom could transact business.[514] The members of the Council were appointed and were to sit during the pleasure of the Crown. The senior member in each was made the presiding officer, except when the Governor chose to preside in the Executive Council. Seniority was left determinable by rules made by the Crown.[515]

COCKBURN BECOMES GOVERNOR.

When Blaney T. Balfour was placed in the government of the Bahamas his commission constituted him a Lieutenant-Governor and the governor's commission of his predecessor, Sir James Smyth, was continued. The latter, however, exercised no authority over the Bahamas after his departure in 1833. The authorities, in the Colonial Department at London at that time, had planned to grant a governor's commission to a person who should reside in some one of the West Indian colonies and exercise supervision over the gov-

[511] Cockburn to Russell, No. 28.

[512] Cockburn to Russell, No. 28.

[513] *Loc. cit.*, No. 28.

[514] Council votes, 1840, pp. 285-6, Mss. Vol. The original document bearing this instruction may be found in the office of the Register of Lands at Nassau.

[515] Council votes. *Loc. cit.* An additional instruction was sent out at this time giving the names of the members of the Legislative Council. They were the Chief Justice for the time being, the Bishop of Jamaica (a seat later taken by the Archdeacon of the Bahamas), Patrick Brown, William Webb, Robert Sandilands, John Good, William Hield, John Storr and William Hamlyn, ranking in seniority in the order in which they were named in the instruction. In all other instances they were to rank in the order of their appointment. A change was made in this order soon after.

ernments of the others. The chief executives of the other colonies were to take rank as lieutenant-governors, which rank was less expensive to maintain than that of governor.[516] The plan was not put into execution. The Executive of the Bahamas ranked merely as a lieutenant-governor until 1840. On the death of Sir James Smyth in 1838 his commission as Governor thereby expired. Francis Cockburn, then in the government of the Bahamas, made application for promotion to the rank of Governor.[517] With the consent of the Secretary of State he applied to the local Assembly to grant a sum as an increase in his salary.[518] The Assembly voted without dissent to grant the addition to his salary and a commission was accordingly sent out to Cockburn as Governor of the Bahamas, which dignity he assumed early in the summer of 1840.[519]

Temporary Administration.

Francis Cockburn obtained permission for a temporary absence from his government in the winter of 1840.[520] He was almost prepared to depart for England when John Irving, the senior member of the Council, who was to administer the government during his absence, died in a sudden attack of apoplexy.[521] This sad event led to a series of embarrassments to the Governor which delayed his departure for over two years.[522] The next member of the Council in the order of seniority was the comptroller of the customs, who was excluded from the temporary administration by the colonial regulations. According to these same regulations the second member of the Council in the order of seniority would receive the commission to act as temporary administrator.[523] Arrangements were completed by which Patrick Brown, now

[516] It would seem that there was no reason for this in the Bahamas. The home government contributed the same amount to the salary of the Executive here, after the change, that it had paid before. The additional amount for the Governor's salary was made up by the Colony. At the request of the Secretary of State this portion contributed by the Colony had been discontinued.

[517] Misc. Letter Book, 1838-50, separate Ds. of April 9, 1838, and Sept. 9, 1839. The expenses of the chief executive were represented to be such, that it was difficult to maintain the dignity of that position at Nassau on the salary that was attached to the office. Besides the lieutenant-governor had to pay out of his salary for his private secretary and for the stationery for his official correspondence. The additional sum for the salary would be sought from the colonial legislature again.

[518] Ds. S. St., 1838, No. 62.

[519] Cockburn to Russell, Nos. 11 and 39 (1840).

[520] Cockburn to Russell, No. 6.

[521] *Loc. cit.*

[522] He had sought the leave of absence for the sake of his health.

[523] By this the commission would have fallen upon Patrick Brown, with John Storr as his alternate. The latter had a dormant commission as temporary administrator. *Loc. cit.*, Nos. 130 and 131 (1841).

senior member, was to administer the government. The customary addresses had been presented and the Governor had set the 26th of July as the date on which he would sail. Four days before that time the July mail brought a commission to Charles R. Nesbitt, the Public Secretary, as Lieutenant-Governor, thus placing him next the Governor, and in advance of all other claimants to the temporary administration in the absence of the Governor. New instructions also came for the swearing in anew of the members of the Executive Council, in which George C. Anderson, the Attorney-General, was now to take rank next to the newly commissioned Lieutenant-Governor.[524] If the embarrassment to the Governor was great, the disappointment of the older members of his Council was greater. A mere seat in this Council gave weight and influence to the holder, but the desirability of holding a seat was greatly enhanced by the possibility of eventually becoming administrator of the government. By this new arrangement the older members were set aside and younger men, the most recent appointees, were placed above them in rank. The consistent and cordial support given to the Governors during so many years could not be expected to continue, if the older members were made to think that they were of less consequence than the then recent appointees.[525] This arrangement also threatened to break down the government control of the House of Assembly, since the public secretary would be compelled to resign his seat in the House on his assumption of the government. It had been far from the intention of the Governor, in making recommendations to the Colonial Department, to bring about such a state of affairs as this.[526] Such tampering with the rank of members of the Council would not have encouraged men of high standing in the community to accept the tender of seats in it. Nevertheless the embarrassing instructions were followed out. The ceremony of swearing in the Council was performed amid the evident mortification of the older members.[527] Cockburn attempted to secure an arrangement by which the former senior member would assume the government, suspending the application of the new instruction. Nesbitt at first agreed to abide by the preëxisting arrangement. Afterwards he refused to do so and persisted in his determination to follow out the instruction.[528] The Governor still delayed to

[524] Cockburn to Russell, No. 130. Ds. S. St., 1841, No. 107, enclosed instruction of May 1.

[525] Cockburn to Russell, No. 97.

[526] *Loc. cit.*

[527] *Loc. cit.*, No. 131.

[528] *Loc. cit.*, No. 130.

take his departure.[529] He insisted that Nesbitt should abide by the former agreement, and recommended that the Secretary of State should lend his influence to enforce that agreement, and he determined to remain at Nassau until he should receive a reply to his despatch making these recommendations.[530] Lord Russell refused to make any change in the instruction.

The Governor might now have hoped to go away from the Colony on his leave. But Nesbitt continued to embarrass him. The latter desired the use of Government House during his incumbency of the government in order that he might perform the social duties of the head of the government. The Governor had planned to leave the building vacant and to have it repaired during his absence.[531] This caused further delay in the Governor's departure. He finally sailed in May, 1842, more than two years after the permission to leave was granted.[532]

This episode illustrates both the vanity of Nesbitt and the strictness with which Francis Cockburn adhered to his business engagements. It was certainly mortifying to the older inhabitants to be set aside for the younger men, but doing it in this instance did not endanger the public interests. Charles R. Nesbitt was an active public man and made an efficient administrator. His elevation to the position was made through no mistake of the Secretary of State. His ability was perhaps second to that of none of those who administered the government of the Colony.[533]

[529] Nesbitt's and Anderson's names had stood at the head of the list in the instruction for swearing in the Council. In his despatch No. 97, of March 12, 1841, Cockburn recommended that they should be placed at the bottom of the list. Lord John Russell replied that the appointment of Nesbitt, and the new instruction, had been made advisedly, and that no change would be made. Ds., S. St., 1841, No. 110 (Aug. 28).

[530] Cockburn to Russell, No. 130.

[531] Cockburn had consulted his Council, in which Nesbitt was sitting, on this matter and it had not occurred to the latter to raise objections to the vacancy of the building during the Governor's absence. The Council had concurred with the Governor in his resolve to repair the house. It had not been occupied by former temporary administrators. Cockburn regarded this conduct as discourtesy on the part of Nesbitt. (Ds. to Russell, No. 132.) On July 31, the Governor wrote further: "During the last twenty years it has not been expected that the temporary administrator of the Government should with his limited salary give public entertainments and it has not been done. . . . I am anxious that Government House should be vacant during my absence. I solicit your assistance again in sanctioning the previous agreement." (Ds. to Russell, No. 136).

[532] Nesbitt to Stanley, No. 1.

[533] After his return from England, Francis Cockburn wrote to the Secretary of State as follows: "I have much satisfaction in testifying to the zeal and efficiency with which he has conducted the various departments of the public trust which

Ecclesiastical Affairs.

There was an established church in the Bahamas. This church was an adaptation of the Anglican Church to the Colony, but with a very poor equipment for serving the religious needs of the people. The Colony of the Bahamas was in the bishopric of Jamaica.[534] The remoteness of the bishop, from this part of his see, almost cut off the Colony from the advantage that might have resulted to the local church from his ministrations. If he had resided in London the church would have derived as much benefit from his direction. The Colony was meagerly supplied with clergymen and churches. Of thirteen parishes only two had clergymen in 1835 when the parish of St. Thomas at Turks Islands was granted a minister.[535] The population of the Bahamas approximated 25,000 and was much scattered. There were a few thickly settled communities. Harbor Island, one of the most important of these, had only a Wesleyan chapel. The Assembly voted in 1835 to supply this place with a church and clergyman.[536] At New Providence in the parishes of Christ Church and St. Matthews were two poorly paid clergymen whose duties inside and outside of their parishes bore heavily on them.[537] In addition to their parochial duties they were the commissaries of the bishop, in the Bahamas.[538] Some other chapels depended on the incumbents of these two places. The rector of Christ Church was also

he has held. In my opinion in talents and in all other respects he is qualified to conduct the duties of any appointment to which you may be pleased to nominate him." (Cockburn to Stanley, No. 7 (1843)). Nesbitt remained in the Bahamas until his death in 1867. He administered the government several times. Seniority in the Executive Council and the succession to the temporary administration were determined in a peculiar way after this time. Lord Stanley of the Colonial Department ruled that the acting public secretary should become (*ex-officio*) senior member of the Executive Council and entitled thereby to administer the government on the death or absence of the governor, or of the temporary administrator (Ds., S. St., No. 38, also Nesbitt to Stanley, No. 6). The temporary public secretary, according to the ruling of Lord Russell in the previous year, was to be appointed by the administrator of the government for the time being, who in this case was the public secretary. Before the public secretary vacated his office to assume the government, his own office would not be vacant, therefore the governor could not appoint a successor to him. (Ds., S. St., 1841, No. 110.)

During the summer of 1903, on the absence of the Governor, the public secretary acted as administrator of the government.

[534] Ds., S. S., 1824, circ. of Dec. 8.

[535] Colebrooke to Aberdeen, No. 54.

[536] H. V., 1834-5, p. 106 and 118.

[537] *Loc. cit.*

[538] Cockburn to Stanley, No. 22 (1842).

chaplain of the troops at Nassau. Conditions in the Out-islands were very backward in this respect. At Rock Sound a population of 2500 had neither church nor minister. The greater part of the remainder of the Colony was equally destitute. Some of the settlements up to 1835 were neglected by ministers or religious teachers. The Colony supplied of itself almost no ministers. It depended on those sent out from the mother country, who were better qualified for the duties to be performed here.

The stipendiary magistrates brought back from their circuits reports of religious destitution. Francis Cockburn still found the same state of things existing on his tour of inspection in 1840.[539] Long Island had appealed for assistance in building a church in 1835.[540] Other islands were calling on the government for the same purpose. Repeated and urgent appeals were made to the home government and to the Society for the Propagation of the Gospel, to send ministers to the Bahamas.[541] In addition to what was received from these sources, the Colony was able to make small appropriations for increase in the church establishment.[542] The local Assembly was reluctant, however, to make appropriations of public money for churches in places where the dissenters had already gained a foothold. It had caught some of the current spirit of determination to ameliorate the condition of the negroes, but it could not keep pace with the needs as they arose. What the local established church lacked was in part made up by the various religious societies in the mother country. They too were making great efforts for the emancipated classes. But these societies had to deal with the whole of the West Indies, and the Bahamas were but a small part of that large field. As it was in the case of the special justices in the apprenticeship system, so in the case of the church, an insufficient number of men were sent out and they were not capable of accomplishing the task that lay before the church. The funds available were inadequate to meet the needs of those who were disposed to supply them. In 1840 an additional clergyman was assigned to parochial duties at New Providence, and two others were provided for the purpose of visiting the Out-islands. The superintendent of the Carmichael School acted as a chaplain. This made a total of seven clergymen of the established church

[539] Cockburn to Russell, No. 20.

[540] H. V., 1835-6, p. 32.

[541] Colebrooke to Aberdeen, No. 54; Cockburn to Glenelg, No. 36 (1837); Cockburn to Russell, No. 20 (1840).

[542] H. V., 1834, p. 118, Colebrooke to Aberdeen, No. 36, and Cockburn to Glenelg, No. 36 (1837).

in the Colony.[543] The visits of the bishop were so infrequent that attempts were made to secure an administrative officer of the church to reside in the Bahamas. This part of the work fell on already overworked clergymen.[544] The application resulted in the raising of the Bahamas to the rank of an archdeaconate. An incumbent of the place was seated in 1843.

The Dissenters.

The dissenters were more active than the established church in meeting the religious needs of the people. They had long been working in the Colony, but their influence among the lower classes was regarded as a dangerous leaven, and restrictions were placed upon them to check their progress. Some of these restrictions were removed during the agitation over the slavery question, but some of them remained until long after that time. Dissenting ministers were not allowed to perform funeral ceremonies in certain of the public burying-grounds. Even more harrowing restrictions as to marriages were retained until 1836.[545] By these regulations a dissenting minister could not legally perform a marriage ceremony in a community where there was an Anglican clergyman. In 1836 a number of marriages that had been celebrated by dissenters at the Turks Islands were legalized by a special act of the legislature.[546]

The Scotch Church was recognized by the government and was aided by the public funds, but it made no attempts to carry on extensive work among the negroes. The Wesleyans and Baptists were most active. These two bodies sent capable leaders to the Bahamas. The Wesleyans seemed to pursue the policy of locating where the established church was already planted.[547] The Baptists struck out into new fields in addition to those which others had occupied. These sectarians were evangelists, not catechists. The old restrictions on the preaching of ignorant persons had been removed, and negroes now entered the lists of ministers.[548] Francis Cockburn, himself a churchman almost to the point of bigotry, saw in this the most dire consequences threatening the Colony. He desired the strict licensing of all preachers and teachers of religion, and inquired of Lord Glenelg as to the expediency of thus

[543] Cockburn to Russell, No. 44.
[544] Cockburn to Stanley, No. 22.
[545] See account of difficulty in regard to this in H. V., 1835-6, pp. 43-45 and 64.
[546] H. V., 1835-36, p. 64.
[547] Cockburn to Russell, No. 44.
[548] Cockburn to Glenelg, No. 105.

restraining these dangerous persons. In 1840 came Henry Capern, a Baptist missionary, preaching freedom of worship and freedom of attendance on religious services, and the fear of God, not of man.[549] On his arrival at Nassau he failed to notify the Governor of his coming. Entering at once on the work of his mission he was very successful. The negroes flocked to hear him and great numbers of them allied themselves with his congregation. Even the scholars from the Anglican schools went over to him. His methods annoyed the Governor. The latter became much more urgent for an increase in the clerical staff of the Anglican body.[550] Cockburn thought that Capern was discourteous to him, as Governor, and that his teaching was dangerous to the public order. The latter refused to sign the indenture for the apprenticeship of a negro girl, objecting that it was "against his principles as a Baptist to sign a contract which required attendance on the worship of the established church." He wrote articles for an opposition newspaper at Nassau, which added to the irritation of the Governor.[551] His unlettered negro helpers preached in the streets. Cockburn complained that this missionary was attempting to weaken the gratitude of the negroes to the home government, by insinuating that the Baptist missionary society was largely responsible for their emancipation. The Governor advised that the society which had sent out this preacher should be asked to recall him, and that a warning be sent to them as to the choice of his successor.[552] But the insubordination so much feared as a result of this man's work never occurred. The public peace was not disturbed on account of him. The Governor, loyal to his own church, disliked to see the people leave it for the sectarians. After Cockburn's departure from the Bahamas the dangerous character of the missionary disappeared, for he gave no such anxiety to Governor Mathew, the next Governor. Cockburn disavowed any belief in compulsion in religious matters,[553] but the course he advised was hardly in harmony with this statement.

In the Out-islands, especially, the sectarians gained among the negroes. In many of these places only dissenters came to teach the people. In such com-

[549] Cockburn to Russell, No. 104.

[550] Cockburn to Russell, No. 44, and to Stanley, No. 11. In the latter despatch he wrote: "Two or three additional clergymen . . . . are needed. It is lamentable to see the lower classes driven into the congregations of the sectarians, more particularly the Baptists, which are increasing every hour from the insufficiency of the numbers in our own church to afford that moral instruction that is so much needed."

[551] Cockburn to Russell, No. 149. McClure, the Scotch minister, was implicated in these publications.

[552] *Loc. cit.*

[553] *Loc. cit.*

FIG. 1.—VIEW OF BAY STREET, NASSAU

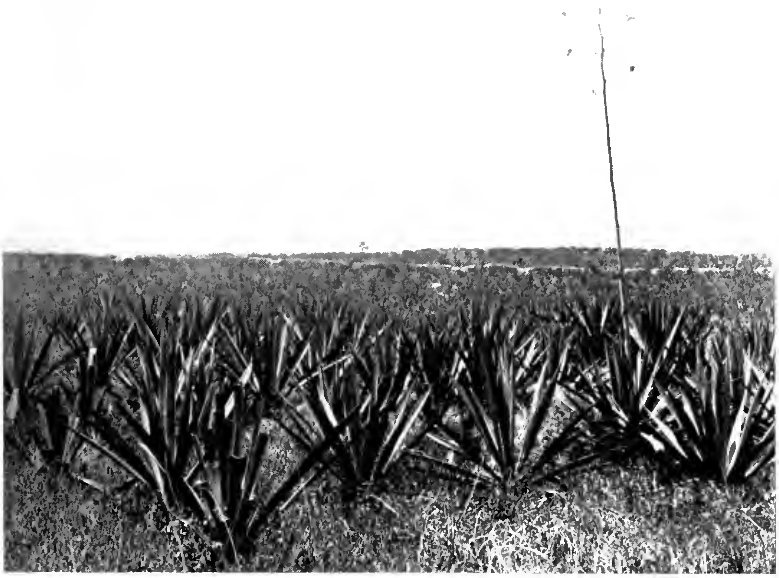


FIG. 2.—VIEW OF SISAL PLANTATION, NEW PROVIDENCE

VIEWS ILLUSTRATING GENERAL CONDITIONS

munities almost the whole population would attend their places of worship.[554] Difficulties arose in some places. At Exuma feeling rose high between the Baptists and the churchmen. A magistrate exacted pledges of a Baptist minister not to hold public services. The pledges were not well kept. The magistrates attempted to restrain the minister and to quiet public feeling.[555] The difficulty was not settled at once. At last when it was composed a virtual victory had been gained for the dissenters.

THE EDUCATION OF THE NEGROES.

This little Colony made great efforts to educate the classes that were so long held in bondage. The wishes of the home government in many respects were disregarded, but in this one particular the local people attempted to follow the recommendations made to them as nearly as their limited means would permit. When the negroes emerged from slavery there were almost no means of education in the Bahamas outside of the meager facilities at Nassau and on New Providence Island. The local legislature had always been as parsimonious in making grants for educational purposes as for other things. Nothing like a permanent grant was attempted. In some cases grants that had been made were withdrawn after a few years, and the schools were allowed to decline. The teaching staff was not kept up and the character of the work done was very bad. The better class of the inhabitants placed little dependence on these schools. Those who could bear the expense, educated their children in England or often in the States. It became a matter of regret to the Governors that the latter country was resorted to for the education of the children of British subjects, for strange ideas were imbibed there, and respect for the institutions of the mother country was not increased thereby.[556] A great obstacle to the progress of schooling lay in the lack of equipment. There were few buildings or other material things adapted to the use of schools.[557] Within fifteen years after the emancipation of the slaves great strides were made, however, in this respect. The resources on which to rely were small, but they were husbanded with great care, and these interests were given the preference over all other claims on the

[554] Mathew to Stanley, No. 77.

[555] *Loc. cit.*, No. 42.

[556] Colebrooke to Glenelg, No. 16.

[557] Reports of Special Justices in Sess. P., 1836, 49, pp. 543-5. At the time these reports were made some school houses had been built on the Out-islands.

public purse. Compared with other colonies, where there were vastly greater material resources, the Bahamas set an example that was worthy of imitation.[558]

The first efforts in educating the negroes at public expense were made by Sir James Smyth, with the liberated Africans, at the settlements at Adelaide, Carmichael and Headquarters.[559] Buildings were erected at each of these places and superintendents were placed in charge of the schools. The Assembly was at daggers' points with the Governor and would furnish no funds for these enterprises at first.[560] The home government supplied some funds,[561] however, and special grants were made for educational purposes in some instances. In 1835 Parliament made an appropriation of £25,000 to be applied for general educational purposes, through the agency of the various societies that were undertaking the religious education of the negroes.[562] Further appropriations were made by the same body in aid of the schools established by the British and Foreign School Society.[563] These schools were continued as established, under the control of the Anglican Church, until after the passing of the apprenticeship system.

Question of the Control of the Schools.

One of the greatest needs of this Colony arose from the scarcity of persons competent to teach school. There had been no school for the training of teachers in the Colony. In many of the Out-island communities there were not only no teachers, but there was no one qualified to read the Scriptures to the people. The few native teachers were themselves so ignorant as to deter parents from sending to them at all.[564] Measures were imperatively necessary to provide for the training of teachers. An attempt to supply this need was made by the managers of the Mico Charity Fund. A normal train-

[558] Governor John Gregory on his arrival in 1849 stated in his first address to the Assembly that he "had had more than ordinary opportunity to compare what the Bahamas had done for education with what other more wealthy colonies have done, and notwithstanding your limited revenue and the heavy expense of the various departments of the public service, you have set an example worthy of imitation in giving the religious and intellectual training of the people a preference over all other demands on the public purse." H. V., 1849, 96. Francis Cockburn wrote to Lord Glenelg in 1837 that he knew of no colony where the means of education had been more liberally supplied than in the Bahamas. Ds., No. 51, to Glenelg.

[559] Balfour to Stanley, No. 28.

[560] Smyth's Ds., Nos. 31 and 72.

[561] *Loc. cit.*, No. 72, and Ds., S. St., 1831, No. 13.

[562] Ds., S. St., 1835, No. 32. On the conditions of these grants see *loc. cit.*, circ. Ds. of Nov. 16, 1835.

[563] *Loc. cit.*, circular of Nov. 16, 1835.

[564] Colebrooke to Aberdeen, No. 5.

ing school was established by them at Nassau. This institution was managed independently of the government and of the church.[565] The conduct of it by its superintendent was far from satisfactory to Francis Cockburn. The master attempted to show independence of the government by writing to the Secretary of State without sending his communication through the regular channel of the Executive,[566] and schools were established and removed without any reference to the government. The school at Nassau was well attended,[567] but Cockburn feared that the policy pursued by its managers would not serve to the best advantage the interests of those whom the fund was intended to benefit.[568] Perhaps the secret of the Governor's dissatisfaction with the conduct of this school was that the teaching of the catechism was left out in its courses, and that the rules governing it were calculated to meet the wishes of the sectarians.[569]

Before 1835 the Assembly had almost absolutely refused to provide for negro education out of the funds at its disposal. In that year an Assembly had been secured which was in a working mood and which was possessed with a disposition to benefit the freedmen. At that time began their real efforts to educate. Hitherto color lines had existed in the public schools. There was now a nominal disappearance of these lines of distinction[570] and a determination to work for the common intellectual training of all classes. The House of Assembly had at last caught the idea that it was in its province to provide means of education, primarily with a view of "disposing men to the worship of God."[571] A general comprehensive system of education was to be provided. A board of education was formed with the Governor as its president. It was given power to make rules and regulations for the government of all public schools in the Colony.[572] Local commissioners of schools were authorized. The liturgy and the catechism were to be taught, and the books used were to be such as were approved by the clergy of the Anglican Church. A certain attendance on the worship of the established church was enjoined on all scholars.[573] The Governor appointed a commission of over

[565] Cockburn to Glenelg, No. 51.
[566] Cockburn to Russell, No. 135.
[567] Cockburn to Glenelg, No. 90.
[568] *Loc. cit.*, No. 44.
[569] *Loc. cit.*, No. 104.
[570] Colebrooke to Glenelg, No. 16.
[571] H. V., 1835-6, pp. 99-100.
[572] 6 William IV, 17.
[573] *Loc. cit.*

fifty members, composed of persons of different religious persuasions, including ministers both of the established church and of the dissenting congregations.[574] The whole Colony was interested in this educating enterprise. Under the direction of the Governor a plan was formed for a school to articulate with King's College at London. Private subscriptions were made for this purpose and the legislature made an appropriation to further it.[575] The King extended his patronage to this institution,[576] but the task before the Colony was too great to be accomplished at once. Considering the chronic low state of the revenues, liberal appropriations were made, but they proved entirely inadequate to meet the requirements of those who were interested in the educational enterprises of the Bahamas.[577]

The board of education began its work under the impulse of the first agitation of the school question. Unanimity of counsels, which prevailed at first, continued only for a short time. The Governor, as president, had only a casting vote in this body of nearly sixty members.[578] The church of the Bahamas had had control of all the public schools of the Colony up to this time; it was not now disposed to relinquish that control, although the dissenters were granted a voice in the too numerous board. The regulations of the schools as far as they had been made were such as the churchmen desired. The Madras system of teaching, in which the catechism held a prominent place, was introduced, and churchmen were planning to conduct the schools on strict Anglican Church lines. The dissenters objected to this. They opposed motions having this in view, in the meetings of the board. Angry discussions ensued and contested points were discussed with increasing ill-feeling. The president of the board ceased to attend the meetings.[579] The stormy sessions continued with no apparent hope of reconciling the opposing parties. A contest was here taking form which was to stir up the Colony for several years. Attempts to remedy the existing evils were not wanting. A change in the constitution of the board was accomplished in 1839. In the

[574] Colebrooke to Glenelg, No. 16 (1836).

[575] Colebrooke to Glenelg, No. 49.

[576] King's College school was never very successful, although it had the prestige of the King's patronage. After several years of varying success, the premises on which it was located were sold by authority of the legislature. This occurred in 1849. 12 Vic., 3, Colonial Statutes.

[577] Cockburn to Glenelg, No. 51.

[578] Cockburn to Glenelg, No. 24.

[579] Cockburn to Glenelg, No. 24.

new body the clergy of the Anglican and Scotch churches were made members, and five additional members were appointed by the Governor. The senior members of the Wesleyan and Baptist missions were appointed, together with others who were admittedly favorable to the established church.[580] This would have perpetuated the control by the established church. The dissenters would not submit to it. No pretensions to harmony in the board were made this time. Stormy sessions and acrimonious discussions occurred with heightened ill-feeling.[581] The dissenters had petitioned against this plan when it was first proposed. It had passed the legislature in spite of them and they were determined that it should not operate as its movers had intended. The life of this new board was but two years in length.

The people were becoming generally stirred up over the control of their educational system. The board created in 1839 was even less satisfactory than the one before it had been. Agitation for changes in its constitution was kept up in order to create a demand for a change. Some proposed to make the Governor-in-council a supervisory board. The board of education itself petitioned against this as a supercession of the Council to its functions. Such objection was easily sustained. But a change of some kind had to be made. The old board was able to accomplish little; the Colony having entered into the educating work was not now to be allowed to leave off, after having gone so far. A board more satisfactory to all classes had become a necessity. The matter was brought into the House of Assembly. A vacant seat in the House became the occasion of a hard-fought contest at Harbor Island to return a member to fill it. Lieutenant Hamilton, a known supporter of the government, was opposed by a leader of the Wesleyan Methodists. The dissenting congregations joined together in support of the latter, and in strong opposition to the former.[582] The result of the election was the return of Lieutenant Hamilton, but this election marked well the character of the contest that had come. Public feeling over the education question rose higher than ever. The majority in the legislature were favorably disposed to the established church. Proposals to it were likely to be such as the dissenters would oppose. They contested every step. The education bill that was finally passed was favorable enough to the established church, but it was very differ-

[580] Cockburn to Glenelg, No. 22.

[581] *Loc. cit.* Cockburn requested a suspension of the royal confirmation of the act constituting this board.

[582] Cockburn to Russell, No. 95.

ent from the bill with which the discussions were begun.[583] During the debates on this measure Messrs. Capern and MaClure were in constant attendance at the House of Assembly, "appearing as most active partisans." [584] As the bill emerged finally, the board, for which it provided, differed from that of 1836 only in that the clergy of all denominations were excluded from this one.[585] This provision was inserted because it seemed impossible otherwise to reconcile the opposing parties. It was now left to parents to decide whether their children should be taught the catechism and what church they should attend. After the passage of this measure the two ministers, who had taken such active interest in it, memorialized the Queen, protesting against it as a one-sided measure. It was as far from pleasing the Anglican clergy as the clergy of the dissenters, because of the small deference paid to them.[586] The board followed the general lines of the Madras system of education, with the exception of the catechism for those children whose parents objected to it.[587] Agitation did not cease for months after the bill became a law. The Baptist missionary continued to be such a source of annoyance to the Governor, on the education question, that the latter repeated his request fr the recall of that gentleman.[588] Attempts were made to secure the repeal of this act. No further changes were made, however, for three years.[589]

[583] Cockburn wrote after the contest that "nothing short of being placed on a dead level with the established church would suit their (the dissenters') views." He was persuaded that there was more ambition than conscience in their conduct. Cockburn to Russell, Nos. 95 and 104.

[584] *Loc. cit.*

[585] 4 Vic., 5.

[586] Cockburn to Russell, No. 104. A member of the Executive Council thought that nothing short of the appointment of Messrs. Capern and MaClure would have satisfied the dissenters. Of those who were likely to be appointed to the board of education, the great majority were members of the established church. As Cockburn was to appoint the members of the board, it could not be doubtful as to the complexion of it. He appointed the Chief Justice, the Speaker of the House, one member of his Council, the Surveyor-General and the Public Secretary. A clergyman at New Providence refused to accept the tender of the Governor to make him a visitor of the schools. *Loc. cit.*, No. 146.

[587] Cockburn to Russell, Nos. 86 and 146.

[588] Cockburn to Russell, Nos. 104 and 149.

[589] Note on Cockburn and Capern. Capern's conduct from his first arrival in the Colony was objected to by the Governor. His failure to notify the Governor of his arrival was perhaps a discourtesy which could not escape the notice of the latter. Cockburn objected to Capern because he did not confine himself to spiritual instruction but meddled in politics. (Ds. to Russell, No. 95.) His teaching among the ignorant people at Carmichael was objectionable. He professed to have been sent out by the Queen for the special protection of the negroes. He disturbed

A Contest for Religious Equality.

This contest was entered into by the dissenters with a determined spirit. Their conduct was a part of the nineteenth century protest against a state church system, transferred to a small corner of the British Empire. It had its significance for the Bahamas. Some such contests had been fought out in the British colonies on the continent, before they won their independence from the British Crown. The Anglican Church had long been established in the Bahamas. It had the prestige of the support of the government backed by a great church system in the mother country. It had intrenched itself in the very life of the Colony; it had acquired control not only of the schools but also of other things as well. State and church went hand in hand, and through the latter the former controlled much in the life of the Colony. The majority of the upper classes of society attended its worship. The dissenters, on the other hand, had become very active only with the emancipation of the negroes, and gained influence chiefly among the lower classes. Their teaching had become so widespread that at this time they were able to begin taking privileges from the established church. The contest was now only fairly begun. The sectarians were here contending for recognition in the Colony of equal rights to all denominations of Christians. This partial victory was only a step in the long contest to deprive the established church of

the contentment of the Carmichael pople. These and other things were reported to Cockburn. The latter deprecated the tone of a letter that was written to these people as filled with "designing insinuations and misrepresentations." (Ds. to Russell, No. 104.) This letter enclosed in this despatch is in substance as follows: "Do not be terrified by authorities into attending this or that place of worship. Go wherever your heart inclines you. No man can interfere with you. If I cannot obtain justice for you at Nassau I will in England. Do not fear that the Queen will sanction your persecutors' conduct. You have the same rights as any white man in the West Indies. If you can be compelled to attend to religious matters, I can be also. Fear God and you have nothing else to fear."

Capern's methods in enticing the negroes away from the established church were odious to Cockburn. "The blacks of this island," he wrote, "are with few exceptions his followers." The Governor also charged that the missionary was misleading the people as to their duty to the state. "He seems to tell them that they are not to be controlled by any opinion expressed by the authorities or by recommendations from them, for Her Majesty had sent him out for their special protection."

Cockburn does not appear to have been justified in making so many complaints against the conduct of this man. The secret of his feeling would appear to be that the mission which Capern was conducting flourished at the expense of the established church, of which in his own words, the Governor had "always been a warm supporter." Ds. to Russell, No. 146. See also Ds. to Stanley, No. 11. See also above, note 550.

its control of the Colony. They saw in the state church a danger to religious equality. At this time when the negroes were coming to command themselves as free subjects, it seemed meet to the dissenters to break up this survival of an old order of things before the new citizenship became adjusted to it. Thus would future generations be spared the necessity of throwing off a vexatious system, that would in their day become more securely fastened on the Colony. The churchmen had been so accustomed to the control of the schools, dictating their policies and imposing their spirit on them, that they were reluctant to surrender that privilege. They could not regard lightly such agitation as this. It caused serious concern to them that the movement had arisen. They resisted with a determination second only to that of those who were assailing their church. The old prejudices that had existed in former times in the mother country were here to control the conduct of men. The Governor, though not active in the contest, was as filled with prejudice as any man within the confines of the Bahamas. Only slight advantages were gained at this time, but the grasp of the church was shaken. The contest was to be kept up until the Church of England in the Bahamas was disendowed and denied a preference in claims on the public purse.

Upon the location of an archdeacon in the Bahamas the incumbent of that position was made a member of the school board and chairman of the body.[590] In the following year the number of the commissioners was changed to seven, exclusive of the archdeacon. They were all laymen and appointed annually by the Governor.[591] Changes were made in response to representations of the dissenters that their clergy were excluded from membership on the board. Whether Francis Cockburn was partially responsible for the dissensions in the board, during his administration, is not easily determinable. It appears, however, that that body was less disturbed after his departure from the Colony. It is probable that the excited feelings of the people had had time to grow calm, when his successor arrived. On the expiration of the education act of 1844 objection to it was so strong that it could not be renewed. An attempt was made to give the new board a more exclusively Church of England formation. This was met by more extensive demands on the part of the dissenters. The new board was created as a committee of the Executive Council. The board could regulate the religious and secular work for the schools, but any minister had power to protest against any books

[590] 7 Vic., 14.

[591] 8 Vic., 13 and Mathew to Stanley, No. 100.

FIG. 1.—SISAL FIBER EXPOSED FOR DRYING

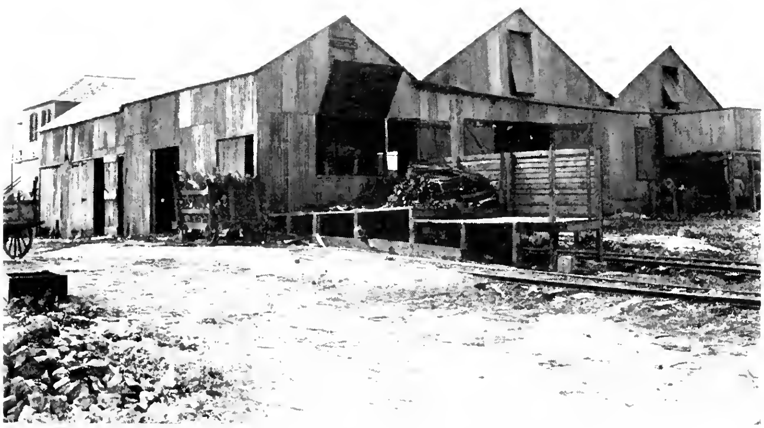


FIG. 2.—SISAL FACTORY, NEW PROVIDENCE

VIEWS ILLUSTRATING GENERAL CONDITIONS

or methods employed that were objectionable. Agricultural and mechanical subjects were introduced into the curriculum. An inspector of schools was created.[592] The execution of these acts was beset with difficulties. At New Providence conditions were more favorable than in any other part of the Colony. Here the schools were most successful in operation. But there was by no means a well-developed system on this island. In the Out-islands the conditions were still very discouraging. There were almost no buildings, there were no competent teachers. The ignorance of the people was deplorable in an atmosphere in which children were growing up and coming to maturity without even the rudiments of an education. The funds of the Colony were so low that it seemed impossible to make rapid progress in improving conditions. A drouth cut off the crops in the summer of 1844, the debt of the Colony seemed to increase rather than diminish, and, in 1848, the Turks Islands, which had furnished a large portion of the revenues, were cut off from the Colony. Such were the conditions against which those who were trying to lift this veil of ignorance had to contend. A letter written by a schoolmaster at Rock Sound, Eleuthera, gives an idea of the prevailing conditions: "We opened school in this district on the 6th September in a house hired from the Wesleyan mission in this place, as no other could be found. No repairs have yet been attempted to be made on the premises, which the board of education agreed to hire from Mr. Sands, and I am inclined to think that nothing will be done to them. There were 85 children admitted to the school when it was first opened, and I regret to say that as many more were refused admission for want of room. The house we have hired is 18 by 21 feet, the only one we could get on the settlement for the purpose, and it is far too small. We have scarce room to form a class in it. It is much to be regretted that the youth of this settlement have been so long neglected. There is scarcely one in twenty of the inhabitants of New Portsmouth who can read and write. This is the case with man, woman and child, yet there is not a finer looking set of people than the young ones of this settlement. They all seem very anxious to be taught, and I have partly promised the young adults to attend two or three times a week when we have a larger schoolhouse and instruct them in the evening in a new and larger house on the commencement of the new year."[593]

[592] 10 Vic., caps. 1 and 26. Also Mathew to Grey, No. 12. It should be observed, that in all these schools, rates were paid by all patrons except a few poor persons whom the visitors in each district designated as non-rate-payers. This was the rule, the observance of it was not strict.

[593] Nesbitt to Grey, No. 49 (1847).

In spite of the adverse conditions, efforts to educate the poorer classes of the Colony were unremitting. With ever low revenues a steady increase in the appropriations was made, in order to keep pace with the growing needs of the educational establishment. A complete change had taken place in the attitude of the legislature towards those who had lately been slaves. Formerly the members of that body had excused themselves from working to ameliorate the condition of this class, and had attempted to lay the responsibility for that condition on the mother country; now on the other hand the responsibility was assumed by the colonists, and there came an ever-increasing determination to place before the negroes the best opportunities for amelioration which the Colony, with the limited resources at its command, could furnish.

Land System.

While efforts were being made to educate the negroes, it was not forgotten that provision must be made for their material welfare. As agriculture was the principal source of wealth in the Colony, it was necessary to put land into the hands of the emancipated classes. Looking at the whole group of the Bahamas it would appear that here would be a large surface for cultivation. The Islands are, in places, too barren for profitable cultivation. The coral rock, of which they are formed, is at best covered with only a thin veneer of soil, while in many places it has been washed bare by the rains. The surface of this rock is full of so-called "pot-holes" in which the soil collects. Into these openings plants are set as in flower pots. This thin soil was seriously injured and in many places exhausted, through the over-production of cotton by American royalists who came to the Colony after the American Revolution. Long before the emancipation of the slaves, these exiled planters had exhausted the best soils of the Colony, after which many of them had emigrated to places where they could carry on more profitable farming. After the emancipation, a new citizenship had arisen and the authorities determined to settle them on these same waste lands. A great deal of the land that had been occupied formerly was again in the hands of the Crown, owing to lapsed titles, and was thus available in that sense for settlement. The authorities in the government evidently knew not the experience of former attempts to cultivate these unproductive wastes. Especially was this true of William Colebrooke, who made such extensive plans for the settlements of these Africans. Some means had to be provided by which these poor people could maintain themselves. Colebrooke

thought he saw what was needed in the vacant lands. He would let down a helping hand to the people, and place them in a position where with a little exertion they could prosper.

The special magistrates under the apprenticeship system had, as an important duty, to take account of any vacant lands in the Colony that were favorable for settlement.[594] They reported several places that seemed suitable for this purpose.[595] But it was not intended to throw these lands open suddenly for settlement at the pleasure of the negroes, for whose benefit they were to be granted. Precautions were necessary to prevent danger to the value of property, and the more permanent interests of society. The progress of the occupation of the lands was to be held in check, the negroes to be guided into the production of staple crops, and not allowed to go where there was promise of immediate but merely temporary gains. The facility of obtaining lands was diminished and only cautious distribution on proper terms was to be allowed. The squatter was to be fought at every turn. The price of land was put so high that it was out of reach of the poorest class, and indeed of all who had not saved some capital.[596] Thus it was hoped to keep all the lands under the control of the government and promote a sound moral and economic state. The disposal of any lands otherwise than by public sale was forbidden.[597] Thorough cultivation was to be promoted and the possession of land made an object of reasonable desire to all. The granting of land to families and gratuitous grants were no longer permitted.[598]

Quit Rents.

Most of the Bahama lands that had been cultivated had been held under the quit rent tenure. The regulations governing these holdings had not been strictly applied. Very loose methods had prevailed in the management of them. Quit rents had fallen into arrears and the holders were careless in paying what was due.[599] Many holders were unable to pay. Even at the rate of a penny or a half-penny per acre rents were left unpaid, the lands on

[594] Sess. P., 1836, 49, p. 512.

[595] *Loc. cit.*, pp. 543-5.

[596] Ds., S. St., 1836, circ. of Jan. 20. This was the general outline of the land policy that was to be followed. The details were worked out afterwards.

[597] *Loc. cit.* This forbade the granting of lands under the quit rent tenure. See this circular in Sess. P., 1836, 48, p. 49 (10-11).

[598] Ds., S. St., 1833, No. 106.

[599] Smyth's Ds., No. 178.

which they were owing often selling for no more than 2d. or 5d. per acre.[600] On many of these vacant lands not more than one acre in ten was fit for cultivation.[601] It is not to be wondered at that the payment of quit rents was difficult to secure. The practice of remitting to delinquents also had gone so far that it would seem that arrears were allowed to accumulate, the holders anticipating that there would eventually be another remission of all they owed. In many instances the arrears amounted to more than the value of the land. If pressed for payment, the holders of such lands would prefer to surrender their titles rather than undertake to pay arrears in full. In 1831 the total arrears amounted to nearly £5000.[602] A remission was petitioned for,[603] but was not secured until 1833.[604] In 1833 was begun a more diligent application of the regulations of these holdings. Instructions were sent from home for a more strict collection of rents together with arrears due from June, 1830, up to which time they had been remitted. The lands were not dear enough to cause all holders to respond to the demands of the collector. By 1835 the arrears were so great that over 100,000 acres of land from these holdings had reverted to the Crown.[605] A better collection was secured from this time forward. No more lands were granted under this tenure, and a more determined policy was followed as to those already held under it.

Failure of Close Settlements.

While the apprenticeship system was in operation, it was determined to settle the negroes on vacant lands whenever they were able to make purchases. Hitherto, alienation of land in fee simple had been very limited in amount. The demand for such possession must have been very small, since so much land could be obtained under the quit rent tenure, payments on which were badly collected.[606] The abolition of slavery and the creation of new freemen, who were possible purchasers of land, greatly enhanced its value. Competition in some of the new settlements was very strong.[607] Measures were adopted which were calculated to promote the appropriation of land

[600] *Loc. cit.*
[601] H. V., 1831, p. 101.
[602] Smyth's Ds., No. 82.
[603] H. V., 1831, pp. 101-2.
[604] H. V., 1825, p. 92.
[605] H. V., 1835, pp. 92-94.
[606] Colebrooke to Aberdeen, No. 27.
[607] *Loc. cit.*, No. 27.

under proprietary titles. Townships and close settlements were formed and Crown lands outside of these places were not put up for sale.[608] Inside of these settlements only small lots were sold, thus tending to concentrate the population in them. A portion of the proceeds of sales was devoted to the building of roads, digging public wells, and making other improvements for the public good. A desire was thus created for the possession of these tracts. A scale of prices was adopted which was graduated according to the size of the lots. Prices were enhanced above what the permanent values warranted. Lands that could hardly have been sold for 2s. per acre sold here in some instances for £5 or £6 per acre.[609] Some of the purchasers labored by the day on the public works in order to pay for their allotments. At Pitman's Cove on Eleuthera, all the land that had been surveyed was soon disposed of and there was a considerable demand for more.[610] Eligible sites were selected wherever they could be found in the Colony, and the people were settled on them. But this kind of settlement continued only for a short time. The first flush of success carried it much farther than its permanent value justified, owing to the lack of virtue in the land itself. Colebrooke continued to form them while he remained in the Colony. Soon after his successor had assumed the government, the folly of his plan was demonstrated in the failure of these settlements. The plan was abandoned under the administration of Cockburn.

Changes Made by Cockburn.

Some other plan for the alienation of land had become a necessity. More and more of the apprentices were becoming free, and lands on which to locate them were needed. Adhering to the circular of 1836, Lord Glenelg ordered that no more Crown lands should be offered for sale for less than £1 per acre.[611] Lieutenant-Governor Cockburn objected, with good reason, that that price was too high for the Bahama lands and that the apprentices would be precluded from making purchases.[612] On application Cockburn was granted discretionary power to fix the price according to the value of the land.[613] Most

[608] Sess. P., 1840, 33, p. 69 (115). Report of Colonial Land and Emigration Commissioners on the Bahama lands, made in July, 1840.

[609] Sess. P., 1840, 33, p. 69 (115). Also Colebrooke to Glenelg, No. 79.

[610] *Loc. cit.*, Ds., No. 79.

[611] Ds., S. St., 1838, circ. of Nov. 12.

[612] Cockburn to Glenelg, No. 5.

[613] Sess. P., 1840, 33, p. 69 (112). The Marquis of Normanby, now Secretary of State for the Colonies, wrote to Cockburn to fix the minimum price at the average price for lands fit for agricultural purposes. See also Ds., S. St., 1839 (Normanby), No. 39.

of the lands that were at the disposal of the Crown in 1839 were such as had been allowed by their holders to revert, in place of paying up the quit rents due on them.[614] The Executive-in-council fixed two scales of graduated prices, one for town lots and the other for agricultural lands, the prices varying in inverse ratio as the size of the allotments. A new schedule of fees was adopted. The whole plan was based on the results of the experience of men in all parts of the Colony.[615] In the graduated scale of prices the Governor had almost exceeded his authority as granted by the instruction. It was objected to his plan that the graduated scale seemed to place a premium on the purchase of large tracts, and that small tracts were not necessary for agricultural purposes, that forty acres was as small a tract as the government ought to deal with.[616] In the following year Lord Russell authorized the granting of tracts of twenty acres at a price of 12s. per acre.[617] This was better suited to the conditions of farming in the Bahamas. The average negro farmer could not well cultivate a tract of forty acres, and it was more convenient for those with small capital to buy small tracts. The execution of the terms of the grants was satisfactory to the people.[618]

While on a tour of inspection, Governor Cockburn called a meeting of the people at the Turks Islands, and adopted a separate plan for the sale of the land there.[619] Separate schedules of prices were fixed for Grand Cay and Salt Cay.[620] At Harbor Island a change was made in the tenure of the agricultural lands. The use of the Common there had resulted in increasing difficulties to the planters. A tract of 6000 acres was sold to the people for $1000 and the grant was made to a magistrate as trustee for the whole settlement.[621] Other settlements desired grants on similar terms, but the

[614] Sess. P., 1840, 33, p. 69 (112), report of Surveyor-General in May, 1839.

[615] Cockburn to Russell, No. 62. Sess. P., 1840, 33, p. 69 (114). Here is given the schedule of fees and prices. These fees were exorbitant, in many cases almost equalling the cost of the land without them. The Governor, his Private Secretary, the Public Secretary, the Attorney-General and the Surveyor-General each received a fee from every purchase of land. Such was a part of the plan to supply land to the poor people at small cost. There were at least two unnecessary fees in this list.

[616] Sess. P., 1840, 33, p. 69 (117).

[617] Ds., S. St., 1841, No. 48.

[618] Cockburn to Russell, No. 62.

[619] *Loc. cit.*, No. 30. Sess. P., 1840, 33, p. 69 (118).

[620] *Loc. cit.* (119). These schedules were subsequently ratified by the Colonial Land and Emigration Commissioners. *Loc. cit.* (120).

[621] Sess. P., 1840, 33, p. 69 (120).

Colonial Land and Emigration Commissioners took exception to such an arbitrary manner of granting land, although the Harbor Island people expressed satisfaction with the method.

The best of these plans for granting land gave no permanent satisfaction to the holders. The prices were too high for lands of such poor quality. Squatting prevailed both under the apprenticeship system and afterwards. In 1839 the House of Assembly threw out the Governor's bill for preventing the unauthorized occupation of land.[622] The attempt of the government to put a check on this manner of occupation was thus defeated. Squatting had become such an abuse that it caused a deficiency in the supply of labor available for hire.[623] The existing law against the practice was rendered useless by its own provision, that a magistrate could not eject a squatter until he had had possession for twelve months. The process of ejectment in the courts was long and tedious. Offenders were not discouraged by this fact.[624] Public and private property alike suffered depredation. The renting of private lands was so unsatisfactory as to engender disputes, which often ended by the tenants occupying Crown lands without title.[625] The occupation of the Out-island lands had not resulted in successful farming ventures. A great deal of the land was held by large proprietors, who cultivated but small tracts and offered no continuous employment for wage labor. The difficulty of cultivating the rocky surface was also a great deterrent to cultivation. Orchards flourished in some places, and a little corn and a few vegetables were produced.[626] On Eleuthera and some of the other Out-islands pineapples were produced for the American market. But none of these yielded lucrative returns for capital invested, except the pineapples in a few small districts.

Commutation of Quit Rents.

The burden of the quit rents remained as onerous as it had been. There was the same disposition on the part of the people to neglect the payment. The House of Assembly hoped to gain a reduction in the amount of quit rents, or a grant to itself of the disposal of the funds arising from them.[627] Failing

[622] Cockburn to Glenelg, No. 9 (1839).
[623] Cockburn to Russell, No. 20.
[624] Cockburn to Stanley, No. 46.
[625] Sess. P., 1843, 29, p. 15 (28).
[626] Nesbitt to Stanley, No. 18.
[627] H. V., 1834, pp. 92-94.

to attain this, it discussed the question of commuting the whole of them in a lump sum. As these were the sole revenues of the Colony which were not at the disposal of the House of Assembly, it was not expedient for the Crown to part with the control of them without the guarantee of a fair equivalent. The House of Assembly was long unwilling either to accept the terms offered to it for a commutation, or to make any just offer. By 1845 the amount of the arrears had reached several thousand pounds, the amount falling due annually being nearly £800. Not more than one-fourth of them, it was estimated, could have been collected. Owing to the financial straits of the Colony in 1845, the Assembly was unable to offer any considerable sum to purchase the Crown's right in the lands. The Secretary of State authorized Governor Mathew to accept ten annual payments of £300 each as full commutation, if the Assembly would vote for that.[628] The Assembly took up the matter and disposed of it finally in 1846. The offer made by the Colonial Department was accepted. All arrears due on lands outside of New Providence, some of them dating back to the time of the accession of William IV, were remitted.[629] Provision was made for the collection of future rents by the Colony. Individual commutation was also provided for.

Salt Ponds.

One of the most permanent sources of wealth in the Bahamas was salt ponds. Salt was called by some the staple of the Bahamas. The warm waters surrounding these low islands contain much salt in solution, and conditions are favorable for the evaporation of them. There were adverse conditions, however. The labor of raking salt was very severe, and doubly so on account of the heat of the tropical sun. It was difficult to get laborers to work at it constantly. As long as the slave system continued, masters could apply their slave labor to it. After the emancipation the laborers were reluctant to do this severe work, and in order to induce them to engage in it, higher wages had to be paid.[630] But the salt crop itself was a precarious one at best. A few hours' rain would destroy the results of months of labor. Fortunately there was a season in the year when rains were less frequent and when salt raking could be carried on. Besides these things there was a difficulty in disposing

[628] Ds., S. St., 1845, No. 87.

[629] 9 Vic., 10. Exception was made for New Providence because it was thought that the enforcement of payment there would not work to the detriment of the holders.

[630] See Balfour to Rice, No. 39.

VIEW OF SILK-COTTON TREE AT NASSAU

of the salt product. Most of it was sold to American carriers, and commercial regulations interfered with their coming to the Islands. In the production of salt, the labor was directed to the introduction of sea water into shallow ponds, by means of canals, and after it had evaporated the raking began. The canals and ponds were constructed at the public expense. The difficult part of the labor was in the raking of the salt deposits. The means by which this was carried on were most primitive, and the tenure on which the ponds were held was such as to discourage the introduction of machinery adapted to raking.[631] The salt produced at the Turks Islands was of the best quality. According to reports it was preferred in the American markets for the packing of meats. More than 96 per cent of all the salt produced in the Bahamas was produced in the Turks Islands.[632] The entire laboring population there was engaged in it.

Regulations of 1781.

Up to the year 1837 the salt ponds of the Turks Islands were regulated by the provisions of an Order-in-council, which had been enacted into a law of the Colony almost without alteration in 1824.[633] According to its provisions all residents in the Turks Islands were allowed to rake salt in the ponds. The ponds were taken possession of and operated in the name of the Crown. They were divided into shares which were distributed annually to those having head-rights. A master of slaves was entitled to a share for each slave he owned, excepting banished criminals. After the abolition of slavery, an apprentice was entitled in his own right to one-sixth of a share.[634] Five commissioners were annually elected by the inhabitants of Grand Cay, and three by those of Salt Cay, who regulated the ponds and apportioned the shares to those who were entitled to them. Persons intending to rake salt were required to appear before these commissioners "with their companies" within twenty days after the annual election. The commissioners opened canals at their discretion; appointed measurers of salt and personally supervised the measurement of the product; and together with the commander, they heard complaints of misconduct of rakers and imposed penalties on offenders against the regulations. No person engaged in the industry was allowed to work on both cays during the same year. All work was required

[631] Balfour to Rice, No. 39.
[632] H. V., 1848 (app.), pp. 22-23.
[633] See 4 Geo. IV, 5. This Order-in-council was sent out in 1781.
[634] *Loc. cit.*, and Ds., S. St., 1843, No. 127.

to be done by daylight; no Sunday labor was allowed; no slave could rake salt until he was proved to be the property of a British subject. Penalties were imposed for removing marks in the ponds, for leaving sails on board a vessel in the harbor at night and for other offenses. The most common penalty was the deprivation of the privilege of raking for the remainder of the year. All shares thus forfeited were at the disposal of the commissioners to be applied for the defense of the Islands. The regulations were annually read in public by the commissioners.[635] In the other islands the salt ponds were not held by the Crown. They were worked under one general system, under regulations made by statute. Commissioners enforced the regulations just as in the Turk Islands. Each holder of shares was required to furnish laborers in proportion to the number of shares he held.[636] None of the other islands outside of the Turks attained any considerable importance in the salt industry.

The regulations of the salt ponds at the Turks Islands were never satisfactory to all classes in the community. Although petitions had gone up for the continuance of them, discontent was frequently manifested and difficulties were constantly arising. These regulations imposed limitations on the production of salt. The annual distribution of the shares precluded the application of machinery to the raking and handling of the product. As no holder would make improvements which he would be obliged to surrender to the enjoyment of another at the end of the year, the work was still carried on in the most primitive manner. The probability of losing the whole or a part of the crop was not lessened.[637] Capital and skill were thus denied their natural advantage.[638] The one-third of the ponds distributed gratis for the benefit of the poor conferred no real benefit on them. Idle and indigent holders regularly sold their shares to larger producers or to speculators. Head-rights valued at \$25 to \$40 were often disposed of in this way for \$4 or \$5. The speculators furnished the sellers clothes, provisions or rum in lieu of money. These things were sold to the shareholders in advance, thus keeping them indebted to the speculators while the latter reaped an enormous

[635] 4 Geo. IV, 5. These regulations, sent out first in 1781, were enacted into law by the legislature in 1824. Petitions were sent in to the Assembly to make them into a law of the Colony in 1802.

[636] See 4 William IV, 45.

[637] Ds., S. St., 1844, No. 35, memorandum on the salt ponds enclosed in this despatch.

[638] *Loc. cit.*, 1843, No. 127.

profit.[639] These regulations further produced and fostered disputes between holders of allotments. Jealousies existed between those on Grand Cay and those on Salt Cay. Objections were made to being subjected to commissioners who were local men. The position of the commissioner became undesirable and odious.[640] Complaints were made that the number of the shares was too great. New arrangements were necessary. The liberated classes were entitled to come into the possession of head-rights in their own name, and justice demanded that they should be allowed to have their right.

Changes were undertaken in 1837 in order to meet the demands of the day. All free persons above the age of twelve years were given rights to full shares, those under twelve to half shares. Apprentices were each granted one-sixth of a share. The tenure of the holdings was increased to five years.[641] At the second quinquennial distribution the negroes would receive full shares with the rest of the inhabitants. The commissioners were authorized to appropriate the proceeds of 10 per cent of the shares to the general improvement of the ponds.[642]

Introduction of Long Leases.

Discontent with these regulations was general. The people at the Turks Islands were not content with the government given them by the Colony of the Bahamas. They liked the regulations of their salt ponds no less than their whole connection with the Bahamas. Complaints were so general that changes occurred again before a redistribution of the ponds, under the five year tenure, was allowed to take place. It was desirable to institute some regulations by which the shareholders would be induced to make some outlay of capital on improvements. The increased subdivision that had occurred in the old system was most objectionable. Experience with the longer leases in the other islands had been satisfactory,[643] and the Colonial Land and Emigration Commissioners recommended in 1840 that two-thirds of the improved ponds should be granted for twenty-one years, and that the remaining one-third be granted in smaller lots on leases not exceeding ten years. They recommended that a minimum price be fixed for lots of the same size, and that the

[639] Ds., S. St., 1843, No. 127, also Cockburn to Stanley, No. 127.

[640] 4 Vic., 20 preamble. Cockburn to Russell, No. 29.

[641] 7 William IV, 11. Ds., S. St., 1843, No. 127.

[642] Cockburn to Glenelg, No. 2 (1838).

[643] Ds., S. St., 1844, No. 35. Also Sess. P., 1840, 33, p. 69 (143). Report of the Colonial Land and Emigration Commissioners.

funds derived from the sale of the leases be expended upon public works for the improvement of the ponds, and further that these regulations should apply to all ponds in the Colony.[644] A new act of the legislature was passed adopting the first recommendations as to the long leases, but it continued for a limited period the gratuitous distribution of one-third of the shares. It provided for a temporary appropriation of the proceeds of the leases to the improvement of the ponds.[645] In making the grants, however, no minimum price was fixed and a systematic distribution was not attempted.[646] Great abuses resulted. Shares that had great value were disposed of at low prices. The fault in this lay with the Governor and the magistrate who arranged for the granting. But the people of the Turks Islands objected to the long lease system. They began to clamor for a change, even before the new system had been introduced. They feared a ruin of their interests, and the agitation was begun which led to the separation of this small group of islands from the Colony.[647] But they were unable to secure a favorable hearing from the authorities who were responsible for the new system. At the expiration of the short term leases in January, 1848, the ponds held under them were again disposed of, but on leases for twenty-one years. They received an enhanced value when put up for sale, the people being very anxious to secure them on the terms now offered.[648] This seemed to vindicate the policy of the long leases even with this short experience.

Adverse commercial conditions added to the difficulties of the salt producers. They were dependent on the American market for the disposal of their crop, and the regulations imposed by the mother country on colonial commerce were often injurious to the interests of these exporters of salt. The Free Ports Act of the preceding century[649] had allowed American vessels to come in ballast and take away salt from the Turks Islands. The ponds of the other islands were not put on the same footing.[650] The American embargo had wrought disaster to their interests. After its removal they had been able to dispose of their product regularly. But the people of the Bahamas were unable to furnish the bulky vessels that were necessary for

[644] *Loc. cit.*, Session Papers.
[645] Ds., S. St., 1844, No. 35, enclosed memorandum.
[646] Mathew to Stanley, No. 25.
[647] See next chapter.
[648] Sess. P., 1847-8, pp. 26 and 69.
[649] Imp. Stats., 28 Geo. III, 6.
[650] H. V., 1802, 86, ff.

carrying salt cargoes. Thus the profit of carrying the product, together with that of importing it into the States, was taken by Americans. These carriers were reported to have taken Bahama salt to Canada as well as to the States.[651] A greater vexation to the inhabitant of the Turks Islands lay in the local regulations of the salt shipping. The Bahama government consistently exacted the payment of the old-time duties on the export of the product and took from the producers a great part of the profit of their industry. In 1845 the market price of salt at the Turks Islands was 3¼d. per bushel. The same export tax was then collected that had been collected when salt was selling for 1s. 3d. per bushel.[652] What made it all the more vexing to the salt producer was the fact that so small a portion of the revenue that was collected in the Turks was expended there, or in any way that would benefit the Turks Islands. Remonstrance against it was without avail.[653] The pressure of this burden was removed only on the imminence of the separation of the Turks Islands from the Bahama government.

Enslavement of Bahama Negroes.

After the slave system had passed away in British territory it continued in the neighboring States and the colonies belonging to other nations. Intercourse with these territories was now beset with difficulties, owing to the continued application of the old regulations against the introduction of free negroes. Many of the sailors, on the vessels belonging to the Bahamas, were negroes and it was perilous for them to visit the neighboring ports. In 1835 William Forster, a Bahama negro, was seized in Florida and sold as a slave, under a law of that state forbidding a free negro to visit its territory.[654] The seizure was brought to the attention of the British minister at Washington, and Forster was released by the courts of the state of Florida.[655] Rumors were afloat that other seizures of the same kind had been made in the same state. The ignorant people of these Islands were not unlikely to be-

[651] Nesbitt to Stanley, No. 11 (1847).

[652] H. V., 1848 (app.), p. 27. Letter of Smith, agent of the Turks Islands in London.

[653] Ds., S. St., 1849, Ds. of Nov. 30, and enclosed memorial and petition.

[654] The law under which proceedings took place provided that any negro who might come to that state should be sent away with a warning not to return. Forster had received the warning, but on his return he had not landed. He was seized on board a vessel in one of the harbors. The seizure was thus illegal H. V., 1835-6, pp. 88-91.

[655] Cockburn to Russell, No. 37.

come entrapped in this way, as there was much commerce between this Colony and the ports of the States. As a warning for the exercise of care in visiting such ports, Lieutenant-Governor Cockburn secured a copy of the Florida law and issued a proclamation, calling attention to the provisions of it that seemed to endanger the citizens of the Bahamas.[656] As a further precaution the Assembly gave the Governor additional powers for the control of the negroes. He could now prevent the removal of a negro from the Colony except on a strict compliance with certain formalities.[657] It was rumored that Bahama whites had been engaged in purposely carrying negroes to slave territory in order to sell them into slavery, but an investigation failed to sustain any such report.[658] During the absence of Governor Cockburn from the Colony in 1842, Lieutenant-Governor Nesbitt gave much attention to the return of citizens of the Colony who were held in bondage elsewhere. He secured the release of two negroes from Cuba[659] and one from New Orleans.[660] He sent the superintendent of the Carmichael school to southeastern Cuba to obtain the release of others who were reported to be held in slavery there. The Lieutenant-Governor of the province of Holguin seized him and sent him under escort to Havana. His mission resulted in no benefit to these negroes.[661] Governor Mathew continued these efforts in behalf of those whose freedom it was necessary to make secure. It was also reported that Bahama vessels were being wantonly wrecked off the coast of Florida, for the purpose of selling their colored crews into slavery.[662] The mission to Florida in behalf of these persons was regarded as dangerous, owing to the reputed hostility of the slave owners there to those who interfered with this ill-gotten property, and it was difficult to get any one to undertake it,[663] as the arbitrary law of Florida continued to be applied. It threatened to interfere seriously with the shipping between the Bahama ports and that state.[664] Retaliation by the liberation of slaves that were brought into Bahama ports was sug-

656 *Loc. cit.*

657 *Loc. cit.*, and 3 Vic., 14.

658 Cockburn to Russell, No. 68.

659 Nesbitt to Stanley, Nos. 34 and 74.

660 *Loc. cit.*, No. 44.

661 *Loc. cit.*, No. 46.

662 Governor Mathew tells in his despatches of three wrecks of this character. They were the Three Sisters, crew of twelve; the Alexander, crew of six, and the Jane, crew of five and one passenger. Mathew to Stanley, No. 84 (1845).

663 *Loc. cit.*

664 Mathew to Grey, No. 74.

gested, but it was not resorted to. No palliation of the evil could be secured, as it was not possible to treat with the state of Florida, and the United States government refused to regulate slavery in the States.

Condition of Labor.

The Bahamas had long since been abandoned by producers of cotton and there was nothing remunerative which could be grown to any considerable extent, on the exhausted soils of the Colony. In 1845 the Governor wrote that there were no means of employment in agriculture except in a few favored locations.[665] The salt industry which was chiefly confined to the Turks Islands, offered employment to the laborers in that group, but in other parts the male portion of the population were engaged in such agriculture as there was, and in fishing, shipbuilding, and many in the uncertain industry of wrecking.[666] Meager returns, at best, came from any of these occupations. There was, however, no considerable depletion of the population. Some did emigrate. The stern dealing with the colonists on the slavery question had caused such discontent, as to lead to the emigration of discontented persons who found it "impossible longer to live here in peace." The restrictions on commerce imposed by the British Parliament caused others to contrast their own position with that of the freedom of the neighboring States. Some left because of this. American traders coming to Eleuthera enticed away some from that place.[667] Those who left the Colony in this manner were mostly white men. As for the negro laborers, not many of them had sufficient means to enable them to emigrate. There was, however, a demand for labor in the sugar-producing colonies, and the people of the latter learned that there were unemployed laborers in the Bahamas. As early as 1838 speculators from Damarara and Guiana began coming to the Colony to make contracts with Bahama negroes for work on sugar plantations elsewhere.[668] They offered increased wages and pecuniary advances in order to induce the laborers to engage their services. To the annoyance of the government, some of the inhabitants were thus taken away. Others from Berbice later undertook the same kind of ventures.[669] These traders wanted only the men, and left their families behind. Some families were thus left destitute of support. Gover-

[665] Mathew to Stanley, No. 135.
[666] *Loc. cit.*
[667] Colebrooke to Aberdeen, No. 62.
[668] Cockburn to Glenelg, No. 75.
[669] Mathew to Stanley, No. 135.

nor Mathew attempted to prevent this evil. He secured the passage, in the Assembly, of an act to compel the exporters of labor either to choose men without families, or to embark wives and children together with the men.[670] This act was disallowed at home but it acted as a temporary check on this practice.[671]

Quiet Reigns in the Colony.

Comparative quiet had now come to the Bahamas. The freedmen had gained a certain recognition as having civil rights, and the old difficulties of the Executive with the legislature had passed. The influence of the government was paramount in the House of Assembly. The good results that had been anticipated from the separation of the Councils had been attained in part, at least, and the last dissolution of the Assembly had thrown the opposition out of power. In the new House, while some disappointments were suffered at its hands, the government was able to accomplish in the main the objects of its program. This House was the first to live out the full term for which it had been elected since 1830.

On the arrival of Governor Mathew the members of both Councils were united in action. The number of members in the Legislative Council had diminished to seven. The Governor appointed to the vacant seats Gahan and Meadows, the respective leaders of the government and opposition parties in the House of Assembly. From both he dared to expect support for his government.[672] The reception to the new Governor in 1844 had been cordial on the part of all classes, parties, and sects. It betokened for him the support of all classes, in promoting measures for the public good. The Turks Islands almost alone were discontented. Some attempts were made to organize a black man's party and to stir up partisan feeling along racial lines. The Governor asked the coöperation of the legislators in discountenancing the movement, and impressing upon the new citizens that their best interests lay in the attainment of " personal character and industry

[670] *Loc. cit.*

[671] Governor Mathew and Earl Grey corresponded in 1847 about a proposed settlement of emigrants from England, on the vacant Bahama lands. No employment offered except salt-raking, and white men were not well suited to it in this latitude. No emigrants came as a result of it. (See *e. g.* Mathew to Grey, No. 28.) Both Cockburn and Mathew recommended the Bahamas as a suitable place for a convict settlement for the West Indies. The employment that offered for the criminals was salt-raking. (Cockburn to Governor Metcalf of Jamaica, letter of February 24, 1841, and Mathew to Grey, No. 28).

[672] Mathew to Stanley, No. 6 (1844).

FIG. 1.—VIEW OF LIMESTONE QUARRY, NASSAU

FIG. 2.—BUILDING CONSTRUCTION AT NASSAU

VIEWS ILLUSTRATING GENERAL CONDITIONS

and not in the force of numbers." [673] Fortunately for the peace of the Colony these things were only significant of individual disaffection or ambition. No organization appeared to give cause for concern. Some violence occurred on the part of a body of Americans and others, during the negotiations over the disputed boundary between the United States and Canada, but there was no serious outbreak.[674]

Governor Mathew and Archdeacon Trew.

Governor Mathew was not allowed to go through his whole administration in quiet. His private character was irreproachable, but it was on this side that he was attacked. Archdeacon Trew of the Bahamas was his chief assailant. Angered by a fancied personal slight, he set to work to secure the downfall of the Governor. He complained to the Colonial Department in London, published a letter in the London Times falsely representing the Governor's position,[675] and was joined by unprincipled persons in spreading infamous reports connecting the Governor with a fallen woman.[676] A plot was formed, and the Receiver-General's office became the meeting-place of the parties, where invectives were loudly declaimed against Governor Mathew.[677] Petitions were sent to London and to the bishop of Jamaica praying for his recall. The archdeacon called a meeting of the local clergy, and rushed through it without discussion a set of previously prepared resolutions denouncing this alleged misconduct of the head of the government.[678] Accusations were kept up until the autumn of 1848. But the evidence in the affair was not all against the Governor. The bishop,[679] the local clergy, both Anglican and sectarian,[680] the members of the two legislative bodies, and the general public,[681] refused to believe in the accusations. The bishop reprimanded the archdeacon, and refused to admit him to holy orders. Finally the haughty ecclesiastic was humbled. He could gain no general credence for his accusations. He repented of his unprovoked course, but blundered again in attempting to make

[673] H. V., 1846-7, p. 117.

[674] Mathew to Gladstone, No. 43.

[675] Mathew to Stanley, separate Ds. of Jan. 10, 1846; also of Dec. 19, 1848.

[676] Mathew to Stanley, separate Ds. of Sept. 9, 1848.

[677] Mathew to Grey, No. 14.

[678] See Mathew to Grey, separate Ds. of Dec. 19, 1848, Nos. 1 and 2; also Ds. No. 148 (1848); also letter to the Bishop of Jamaica of Sept. 23, 1848, in Misc. Letter Book of Governors, 1838-50.

[679] Mathew to Grey, separate Ds. of Dec. 19, 1848.

[680] *Loc. cit.* Ds. of Sep. 25 and Dec. 19, 1848.

[681] Enclosures in Ds. of Mathew to Grey, No. 14 (1849).

denials of his own misconduct to the bishop. It was too late to retract. His desire to get revenge had brought him only disrepute. To some of his accomplices, participation in this affair was only an added act of baseness. Such were the associates in iniquity of one who should have been an example to the people of the Colony.

This affair caused the removal of George B. Mathew from the government of the Bahamas. The Colonial Department in London acquitted him of the charges but would no longer intrust to him the administration of the government.[682] Earl Grey, the Secretary of State for the colonies, had evidently thought that the woman, with whom he was accused, had some claims on him, for he had used his patronage to help her husband. On the discovery of this fact Earl Grey decided to recall him. On November 16, 1848, he wrote: "The confidence of Her Majesty in the administration of your patronage would be absolutely destroyed by the discovery that you are using it to provide for an unworthy woman. Nor would it be possible after it became known, for you to enjoy the respect of the colonists necessary to your due influence in the government for a proper exercise of the duties of your office."[683] He was further informed that his successor would be sent out as soon as possible, and that he might retire from the Colony as soon as he desired.[684] Governor Mathew left the Bahamas in February, 1849.

This administration marked an advance in the progress of the Colony. In many lines there had been improvement. The Governor's solicitude for the welfare of the community became the subject of remark in the address of the Executive Council, which was nearest to him in the government.[685] The House address was eloquent in praise of his efforts for the good of the Colony. It acknowledged the business ability of his administration, his accessibility to all classes, and expressed its appreciation of his efforts "to carry out every measure calculated for the advantage of the Colony and the community." His success therein was manifest on every side, in every department of the public service, and in every establishment at Nassau.[686] The people acknowledged the advances made in the educational establishment. On his assumption of the government, wrote the Governor, "the statute book was suited to the eighteenth century: a poll-tax on strangers impeded trade, the poorhouse at Nassau

[682] Ds., S. St., 1848, separate Ds. of Nov. 16.
[683] *Loc. cit.*
[684] *Loc. cit.*
[685] Mathew to Grey, No. 14 (1849), enclosure No. 1.
[686] *Loc. cit.*, address of the House.

was the sole public institution and the militia was but a name." [687] In spite of the famine and depression in trade during his administration of four years the colonial debt had been reduced and a surplus revenue secured; the poor establishment was enlarged and a hospital and dispensary established; a public library was added to the equipment for education; the militia was placed on a substantial basis; the civil list was adjusted to the existing needs of the Colony and the efficiency of the officials was increased: salt ponds were everywhere worked, fruit growing extended and the tariff schedules readjusted; in every department the colonial service experienced the touch of an administrator.[688] It was a hard fate that this man who had done so much for the Colony, the first Governor in the nineteenth century who had been able to secure harmony in the government service, should have become the mark of all the calumnies that were heaped upon George B. Mathew. "A prophet is not without honor save in his own country."

LATER HISTORY OF THE BAHAMAS.

During the latter half of the nineteenth century the people of the Bahamas have remained contented under British rule. The slavery question passed out of men's minds and the control of local affairs was taken into other hands than those of the radical, former slaveholders. The Colony now entered upon a period of internal quiet, which with a few temporary interruptions has continued to the present time. Some of the more important topics in the recent history of the Colony will now be discussed briefly.

THE SEPARATION OF THE TURKS ISLANDS FROM THE BAHAMAS.

Before the close of Governor Mathew's term of office in 1849, the territory of the Bahamas was decreased by the separation of Turks Islands. This small group of islands, situated 500 miles from the capital of the Colony, had never been contented under the Bahama government. The people of Turks Islands claimed that they did not belong to the Bahamas, and after refusing to participate in the government, submitted to it only by the order of a proclamation from the Crown. Still it was odious to them to accept the government of a Colony in whose interests they shared so little. While the Bahamas were almost wholly agricultural, the Turks Islands produced nothing but salt. When the former legislated to protect agricultural interests, the regulations often

[687] See Mathew to Grey, No. 71.

[688] Mathew to Grey, No. 71, and the addresses above referred to.

bore with grievous weight on the latter. The Turks Islands were also so far removed from the seat of government as to gain little benefit from connection with the Colony. Communication with Nassau was hindered by a long stretch of treacherous seas, swept with tides and full of dangerous rocks. Contrary winds added to the difficulty of navigating here. Intercourse with London was regular and far more frequent than that with Nassau. The evil results of this were, that little was done to preserve public order in this community; that the people here were practically denied recourse to the higher courts of the Colony; that they knew little of the conduct of the government; and worst of all, that for many years they neither participated in, nor exerted influence upon, the affairs of that government. But all these things might have been borne with, had it not been for the careless financial treatment accorded them.

Although the Turks Islands consisted of but two small islands and some insignificant cays they nevertheless contained one-tenth of the population of the Colony, and were the most important industrial community in the Bahamas. Their contribution to the public revenues was far out of proportion to their population. In the twenty years from 1827 to 1847 they yielded nearly one-fourth of the whole income of the public treasury, but their interests were left out of consideration in making up the budget of the Colony. And only about one-half of the money collected in these islands was expended in any way which would benefit their people. In 1845, when the price of salt was low, the same duty was collected on its exportation that had been taken at the beginning of the century when salt was much higher. The protective duties frequently imposed on food products, although benefiting other interests, operated prejudicially to the Turks Islands, whose people imported all their necessaries except salt.

The Turks Islands had remonstrated repeatedly against these evils, and as often prayed for relief. But this had proved to be of little avail. To many complaints a deaf ear was turned; to others the Bahama Assembly had responded with futile measures of relief. At Nassau those who controlled the government knew little and cared less about the interests of the Turks Islands, and matters grew worse instead of better. In 1844, a new set of regulations of the salt ponds was introduced. The old short term leases that had prevailed for many years were superseded by a system of long ones. The people feared ruin from these new measures. Burdened as they were in other ways they could not submit to what they considered to be a new imposition. They protested against it. They seized upon their connection with the Bahama gov-

ernment as the cause of this new difficulty and clamored for a separation from the Colony. The agitation begun over this really wise change in the conduct of the salt ponds led to a long series of complaints, and in urging the question of the separation, the people reiterated all their past grievances.

The authorities at London and the Governor at Nassau investigated the conditions and found that there were legitimate causes of complaint. Chief among these was the financial grievance, already mentioned. Attempts were made to remedy the evils and to reconcile the people to the Colonial government. They were not, however, to be thus diverted from the real object of their petitions. They were not discouraged by the refusal of a hearing to their agent in London or by the rejection of their petition for the separation. They were determined, if possible, to be severed from the oppressive Colony. They never lost the confidence that their object would be attained if the actual conditions could be brought to the attention of the authorities.

Governor Mathew at first minimized the importance of their grievances and represented that the agitation was due to a few disaffected individuals. But upon a thorough investigation of the conditions he admitted the existence of the evils, and in 1847 recommended the separation. The Turks Islands did not cease, however, in their efforts to secure the great object they desired. Earl Grey, who took charge of the Colonial Department in 1846, was the third Colonial Secretary to whom they had applied for this purpose, and at last in 1848, he sent to the Governor plans for the separation. The latter framed a bill embodying the terms on which it was to be allowed, secured its passage through the reluctant legislature, and the connection of the Turks with the Bahamas was severed. The Caicos Islands, which lie near the Turks, were placed with them. The two groups were henceforth to be ruled by a President and Council, directed by orders of the Crown-in-council, and under the supervision of the Governor of Jamaica.

This division of the territory of the Colony relieved the Turks Islands of the burdens under which they had been laboring. They were now to be free to manage their own affairs. To the Bahamas the principal result was that of causing a temporary depletion of the public revenue, together with a slight decrease in the expenditures on account of the withdrawal of the Turks Islands. But a few years later the public revenues were as large as they had ever been.

The Public Burial-Grounds.

The established church of the Bahamas continued to exist. The contest over the control of the public schools, noticed in the preceding chapter, was

only a first step in the contest for religious equality. Other things pertaining to the state church remained as before. But now that the dissenters had succeeded in snatching this important privilege from it, they were encouraged to attempt other reforms when an opportunity offered. Although the established church failed to keep pace with the dissenters in strength of numbers, no one attempted, or desired, to sweep away the whole system at once. Among the privileges remaining to it in 1851 was the custom according to which dissenting ministers were denied the right to conduct funeral ceremonies in the public burial-grounds. A concrete example of the results of this custom brought the evil prominently to the attention of the people and aroused public sentiment. At one of the public cemeteries in New Providence a disturbance, almost amounting to a riot, occurred when an attempt was made to enforce the observance of the custom above referred to. The dissenters decided to submit to it no longer. In order to avoid further difficulties, they applied to the church wardens of the several parishes on the island to remove this discrimination against their ministers. The wardens of Christ Church parish laid the petition before the Governor. He ignored it and the wardens refused to consider it further.

This was only a temporary check on the dissenters. They were determined to bring about a change. They regarded the necessity of employing Anglican ministers at all funerals as a restriction on their rights of conscience. In a public meeting they resolved to appeal to the legislature to remove the grievance. They adopted resolutions declaring their position, and their leaders presented to the House of Assembly a petition signed by about 800 names, in which they represented that the public mind was deeply agitated over the matter and expressed fears, that unless a change soon occurred, the discontent would result in further disorders. On the other hand the members of the established church were not inactive. They were as firmly convinced of the injustice and illegality of the conduct of the dissenters as the latter were of the existence of the same things in this invidious custom. Regretting the partisan agitation they prayed that no law should be passed permitting the invasion of the long-established rights of their clergy. The House of Assembly hesitated to act on the matter, and referred it to a committee which was instructed to report on it at its next session.

In the interval between the meetings of the legislature the Governor referred the question to the bishop of Jamaica. The latter favored the views of the dissenters. Not only did he approve of the removal of the restriction, but

he also advised the government to take the initiative by submitting to the legislature a bill to carry out the reforms. Such a bill was accordingly laid before the Assembly. The House readily passed it, the Legislative Council only with reluctance. Its passage was sufficient to quiet the minds of the sectarians. The agitation ceased at once. The following year the Governor reported that although a "lamentable amount of sectarian animosity" had been aroused, the change from the old usage had operated beneficially to the state of social feeling in the Colony.

The Bahamas a Bishopric.

In 1861 the Bahamas were separated from the diocese of Jamaica and themselves erected into a bishopric, and the then archdeacon of the Colony was promoted to the seat of bishop. The established church continued to receive support from the public treasury until 1869. The disendowment came at that time as a result of the financial depression following the American Civil War. The discussion of this question of disendowment will therefore be deferred until later.

Commercial Conditions.

The Bahamas have never had a permanent trade of any great magnitude. It was long hoped that Nassau might become the center of such a commerce, and these hopes seemed about to be realized when in 1843, the Royal Mail Steam Packet Company made this port the distributing point for its West Indian mails. This arrangement, while it lasted, added greatly to the ease of communication with the outside world, but it was destined to continue only a few years. Several things contributed to lead the company to remove its base from Nassau. The harbor was not suitable for vessels carrying the mails. The route through the Bahama waters was unsafe owing to the great number of banks and projecting rocks, and other ports in the West Indies offered better anchorage and better facilities in other respects. After its removal the trade of the Colony relapsed into the old channels. The ports were less frequently visited by carriers of commerce, and the Islands again suffered from that same isolation which they had felt before. At times it was difficult even to keep up regular communication with the outside world by mail.

Blockade-Running.

A great change in commercial conditions occurred during the American Civil War. Owing to the extraordinary circumstances existing in the neigh-

boring States, the trade of the Bahamas assumed extraordinary proportions. Although the ports of the Confederacy were blockaded by American vessels of war, there was a constant intercourse between them and the Bahamas. As soon as the closure of these ports was attempted, a trade by blockade-running sprang up. Cargoes of supplies of various kinds were carried inside the lines of the hostile fleet, and exchanged for cotton grown in the South. Nassau, being only a few hundred miles from the coastline of the continent, figured conspicuously in this forbidden commerce.

Early in the war the British Foreign Office proclaimed the neutrality of the British possessions. On January 31, 1862, the Governor of the Bahamas was instructed not to allow the war vessels of either belligerent to enter or remain in any of the harbors of the Colony except under stress of weather, or by special leave of the government. The ports were not to be allowed to become bases for warlike supplies; and further belligerent men-of-war were not to take supplies in these ports, except such as were necessary for the subsistence of their crews. About the same time, another proclamation from the Crown called upon the colonial legislature to prohibit the exportation coastwise of arms, ammunition, military and naval stores. The local government, perhaps, regulated its conduct according to the letter of these instructions, but if reports are to be trusted, deliberate infractions of their spirit were allowed to take place. There was always an apparent attempt at a stern enforcement of the regulations, on the approach of the warships of the United States. On the other hand, there was a certain indulgence shown towards violations of the same, which turned out to the profit of the rebels.

Early in the year 1862 the Flambeau, an American vessel, came to Nassau. Her captain desired to come into the harbor to fill her coal bunkers from a collier which attended her. Governor Bayley denied the request and was upheld by the authorities at London. Soon after this Charles Francis Adams, the American minister at London, protested to Lord Russell against the employment of Nassau as an entrepot for contraband trade and a refuge for blockade-runners. Although a strict enforcement of neutral regulations did not require the prohibition of these practices, Lord Russell did warn British ship owners and merchants, that Great Britain would not protect their vessels against search and seizure by the American navy; and advised that the true course for them as neutrals was to refrain from the forbidden traffic, as it could only cause irritation in the relations between the United States and Great Britain. However great the inconveniences of the probable interference with this com-

FIG. 1.—VIEW OF SALT PANS AT RUM CAY

FIG. 2.—VIEW OF SALT PILES AT RUM CAY

VIEWS ILLUSTRATING GENERAL CONDITIONS

merce, it was engaged in entirely at the risk of its carriers. But reports of real violations of neutrality, which were undisputed, came to the American authorities. Mr. Adams also complained that the same port was being used as a place of deposit for munitions of war for the rebellious states, and that a gunboat built in England had resorted to Nassau to receive a crew of Confederate sailors, and thence to prey upon American commerce.

Severe treatment was accorded to vessels and crews that fell into the hands of the blockading squadron. One-half of the vessels that tried to make the trip in 1862 were captured. In May, 1863, the Margaret and Jessie, plying between Nassau and Charleston, was fired upon and sunk near the island of Eleuthera by the man-of-war Rhode Island. Her commander claimed that she was engaged in legitimate trade and that she was fired on within one mile of the shore line of British territory. These claims were not sustained by the findings of the American prize court and no redress was given. In spite of the frequency of the captures the trade increased. The profits to be derived from a successful trip were so great that many were willing to undergo the risks. Great quantities of supplies were carried to Nassau from British and even from American ports, which were destined for the use of the Confederates. Trade from Liverpool and Cardiff, that could not otherwise have hoped to reach the southern States, was conducted with comparative safety through the port of Nassau. The customs officers at New York required security for the good faith of certain shipments made from there to the Bahamas. Great Britain protested against the bonding of British carriers in this way.

In the latter part of the war, the frequenting of Bahama ports by United States warships formed the subject of protests from London. Abaco, Inagua, the Biminis and other places were visited, and complaint was made that a virtual blockade was maintained at some of them. But the Bahamas were not the sole transgressors. Other parts of the British West Indies were also used as bases of the same kind of semi-hostile operations against the United States. Both sides were guilty of infractions against proper conduct. The British islands, however, profited more by it than did the American navy.

Nassau flourished. Her prosperity was altogether due to the part which her harbor and geographic position played in this commerce with the southern cities. Both imports and exports rose to a high point. The imports amounted to £274,581, in 1861, to £1,250,322 in 1862, and to £3,368,567 in 1863. The exports had stood at £141,896 in 1860. In 1861 they rose to

£195,584, in 1862, to £1,007,755, and in 1863 to £3,368,567.[689] The profits of a successful venture were only enhanced as the Union troops drew their lines more closely on the Confederacy and other sources of supply were cut off. Prices of necessaries became very dear in parts of the South. Trading through the blockade reached its highest point about the close of the year 1864. The imports at Nassau for that year amounted to £5,346,112, the exports to £4,672,-398. But in March, 1865, the American consul at that place reported that blockade-running had become a thing of the past. This sudden decline was doubtless due to the reopening of the southern ports after Sherman's march to the sea.

While this commerce was so flourishing, Nassau reached the high tide of her prosperity. Mercantile and professional pursuits made fortunes rapidly; but persons with fixed salaries suffered on account of the great rise in the prices of necessaries. The value of landed property at Nassau was increased to 300 and 400 per cent. Wharf space on the harbor front became so valuable that the harbor along the shoreline was filled in and several new blocks thus added to the city. Great was the profit at the expense of the belligerents. These were the halcyon days of the Bahamas, and the inhabitants still think of the days of the war as the "good old times" of prosperity and plenty.

The people were exultant over their good fortune. In 1863, Governor Bayley addressed the Assembly, dwelling on this new commerce as a principal theme in his speech. He congratulated the people that under British protection they could have commercial relations with either belligerent. On the other hand he lamented that this commerce was exposed to frequent losses at the hands of the naval power predominant in the neighboring waters. He further lamented that American publicists were insisting that the conduct of the people of the Bahamas was not consistent with relations of friendship and amity with the United States. He gloried in this prosperity, although it was at the expense of a nation struggling for self-preservation. In 1864 the Governor went still further in the same tone, but his speeches to the legislature did not meet with approval at London. The Duke of Newcastle, of the Colonial Department, refused to approve of the Governor's reference to the practice of

[689] A slight difference appears between the report from which these figures are taken and that given by Northcroft in his "Sketches of Summerland" (p. 303), in the item of exports for the year 1860. The figures here given are taken from the reports of Governor Rawson on the state of the colony for the years 1862 and 1863, as printed in the Session Papers of Parliament for 1864, vol. 40, p. 11, and 1865, vol. 37, p. 16.

blockade-running. He admitted, with the latter, that international comity did not bind Great Britain to repress the practice, but he warned him that blockade-running was a breach of the belligerent's right of blockade, and that the power sinned against could properly complain that the representative of the Crown of Great Britain was speaking officially and encouragingly of a practice that was injurious to its interests. It might sound well to the Bahama ear, but by doing it the Governor laid himself open to the charge of conduct unfriendly to a neighbor, thus impairing the position of the government he was serving. The Governor attempted to justify himself on the ground that eminent jurists and publicists admitted the right of running through the blockade of a belligerent. But his attempted justifications failed to remove Newcastle's objections to his speech. He was advised that whatever opinions he might hold, he was not expected, without authority, to express them respecting the relations of Great Britain and other powers; and that the spirit and tone of his address could not but be injurious to the United States. The removal of Governor Bayley from the Bahamas took place before the end of the year.

The new Governor, Rawson W. Rawson, reported that in the months of January and February, 1865, twenty vessels reached Nassau from within the blockade lines, and twelve others were run down by American cruisers. After February, only three such vessels arrived. A very sudden conclusion to a large trade. Some activity in commercial lines continued after the downfall of the Confederacy, but trade relapsed quickly into ordinary channels, and a period of stagnation followed. The great commerce was entirely due to the extraordinary set of circumstances, as Nassau was not a port to attract a large permanent trade.

State of Finances.

The revenues of the Colony had grown great without the imposition of any additional tax on imports or exports. Increases were made in the regular expenditures, the debt of the Colony was paid off, and a surplus accumulated in the treasury. These were extraordinary financial conditions. With the falling off of commerce after the close of the war, the revenue inevitably failed to keep up to the point which it had reached. Expenditures again overbalanced revenues. Before this change took place, the Colonial Department at London, noting the increase in revenue in the Colony, gave notice that it must provide out of its own funds for the salary of the Governor. Such an instruction, however, could not have been based upon a study of the permanent

finances of the Bahamas. Retrenchments now became necessary in order to keep salaries and expenditures adjusted to the depleted state of the revenues. A hurricane accompanied by an enormous destruction of property occurred in 1866, and added to the embarrassment. By 1868 the deficits had become so great as to threaten the credit of the Colony, and some difficulty was experienced in securing a readjustment of the finances.

Disendowment of the Established Church.

Convenient methods of reducing public expenditures were now sought for. Some of the members of the House of Assembly found an expedient in a proposal to withdraw the public support from the established church. The majority of the people of the Colony were not favorable to that church, and the double tax for church purposes on the members of dissenting congregations was viewed with displeasure. The process of disestablishment had been begun already, and in the then low state of the revenues it seemed to be an opportune time to begin the agitation for disendowment. A great reduction in expenditures would be effected if the cost of the church establishment were saved to the Colony.

During a session of the legislature in March, 1868, a member of the House brought up the question without previous warning. He introduced a set of resolutions embodying a scheme for the disendowment. His proposals were carried by a majority of four, and a committee was at once appointed to bring in a bill in accordance with them. Such a bill was readily passed in the House. But in the Council it was rejected. When this intelligence reached the House, Sawyer, the leading advocate of the bill, proposed to call upon the Governor to dissolve the Assembly and order a new election. The same majority that had carried this bill for the disendowment carried this proposal also. The Governor, however, regarded such a call upon him as an attempted infringement of the prerogative. He expressed his ignorance of the alleged discontent on the part of the people as to the church question, and refused to dissolve the Assembly. The House now unearthed a number of precedents for its request for the dissolution, caused the resignation of its presiding officer and adjourned for three months. Before the expiration of that period a dissolution occurred. On the meeting of the newly elected representatives in June of the same year, a disputed seat in the new House occupied first place in the deliberations of the session. According to the returns, Sawyer, who had led the attack on the established church, had failed to be elected. He

made charges of unfairness at the polls and petitioned the House to allow him to occupy the disputed seat. Counter charges, and petitions were offered in behalf of his opponent. A House committee secured information and made a report on the matter. This report may have been impartial and the subsequent action of the House just, but it was a strictly partisan vote that rejected the petitions of the Anglican candidate and allowed Sawyer to take the contested seat. Both his leadership and his vote would have been lost if his application had failed. Again he moved for a consideration of the disendowment question. Loyal churchmen attempted to postpone the evil day. But the old partisan vote carried a new bill to "amend the ecclesiastical laws of the Colony." The Legislative Council repeated its action of the preceding session and the measure was again rejected.

Such obstacles could, however, only temporarily check the progress of the dissenters. In March, 1869, the same leader pressed for the passage of the same proposal, even more importunately than before. The Council no longer stood in the way. It merely modified the sweeping character of the language of the House bill and passed it. This did not effect an immediate withdrawal of the salaries paid to church officials. The cost of each of these livings was only borne by the public until it became vacant. Then the salary was withdrawn. This effected only a gradual disendowment, but it gained the object of the dissenters and secured the retrenchment in public expenditures.

The Anglican church was not yet free. It had been given control of its property in 1869, but was still dependent on the state in other respects. On an appeal to the legislature in 1875, it was made a self-governing, voluntary religious body with privileges of holding a synod, making rules for its own government, regulating its membership and prescribing its rites, discipline, etc. At the same time some old ecclesiastical legislation was repealed. The legislature dealt with the question in a liberal and impartial spirit, and the church was relieved of an anomalous position in which it had been since the passage of the act of 1869. The disestablishment was thus completed.

The Educational Establishment.

The careful efforts in behalf of education that were begun in the decade 1830-1840 were continued. The Assembly was impressed with the need of providing adequate means of instruction, and in this it was encouraged and directed by the governors who acted with it. Since the control of the schools was wrested from the established church, no serious efforts had been made to

return to the old state of things. Therefore the public schools became nonsectarian, and religious dissensions no longer stood in the way of the development of the educational system. All classes of the people joined in the movement for popular education. The finances of the Colony were straitened, and continued to be so, but in spite of that fact a gradual expansion in the educational establishment had taken place, requiring increased appropriations from the public funds. Under the stress of financial difficulties the public grant was greatly reduced in 1869. From that time up to the present, appropriations for school purposes have been growing, these interests still being given claim to first consideration, in making up the budget of the Colony.

In the extension of the educational system great discouragements had to be met. In most of the communities that were to be served there was nothing pertaining to a school but children. In some places they were so scattered that it was difficult to bring them together. Foundations had to be laid. In 1859, there were twenty-six schools in the Bahamas employing thirty-nine teachers. All of these schools did not occupy buildings that were public school property, or that had been erected for educational purposes. Some of the houses were in a dilapidated condition; while others that were almost worthless cost the Colony exorbitant rents. The teachers were not all of the best character; while some of them were of a fair order of intelligence, and were diligent and devoted to their work, others on the other hand were very poorly equipped. In many instances teaching became a refuge for persons who were otherwise destitute of means of subsistence. The complaint was common that the teachers neglected their own intellectual advancement, thus rendering themselves unfit for efficient school work. Another difficulty was that parents showed a lack of appreciation of the advantages that were before their offspring. The veil of ignorance could only be lifted slowly.

Existing conditions were studied, however, and an attempt was made to bring them to the attention of the public. An inspectorship of schools was created. The incumbent of this position visited the schools throughout the Colony, examined them and their teachers, and made annual reports of his findings. Methods employed and progress made in other colonies were studied. Such funds as were available were applied to the execution of plans resulting from the consideration of these things. The schools of the British and Foreign School Society were taken as the model for the schools that were established. But the public treasury could not supply funds to create schools in all places where they were needed. A new system of founding

schools was introduced, which was attended with results that were most encouraging. This was the Grant-in-aid System. Under it communities that originated schools by local effort were aided by the public funds, on condition that the schools established would be non-sectarian; that they would be conducted on lines laid down by the Board of Education, and subject to the examination of the public inspector. This extended the benefits of education to a number of settlements, that might otherwise have continued without schools, and served to promote a more intelligent appreciation of the advantages of education.

A serious drawback to the progress of the schools lay in the low estimate of their value, on the part of their patrons. Many seemed indifferent to the opportunity afforded their children. The attendance was consequently poor. Some of the school rooms were reported to be a half to two-thirds empty. The schools, to be sure, could not accommodate all children of school age in the Colony, but there was room for more than were in attendance. The enervating climate, the natural indolence of many of those who were to be served, and the desire of many parents to have their children occupied in remunerative employments; these things militated against the success of the schools. The inspector, noting these conditions, repeatedly recommended the passage of a compulsory education law. After twenty years of such recommendation, the legislature at last gave attention to this apathetic indifference to educational advantages, and enacted a law requiring attendance at the schools on the part of all children between the ages of six and twelve. At first this applied only to the island of New Providence. But its salutary results there influenced the legislature to extend its provisions to certain settlements in the Out-islands. Increased attendance and an increased number of school days resulted. There were numerous instances of the application of the penalties for disregard or neglect of the law in the districts to which it applied. In 1889, this law was made applicable to every school district in the Bahamas. This regulation was not, however, without evil results. Parents were more careful to send children that came within the age limit of the law, but on the other hand, they took them from the schools as soon as they passed that limit. The attendance of those over twelve years of age was very irregular. In 1897, the age limit was raised to fourteen years with a corresponding increase in favorable results.

The payment of fees for attendance at the public schools was retained until 1886. In 1885 the inspector recommended the abolition of them. They had been difficult to collect throughout the history of the schools. The

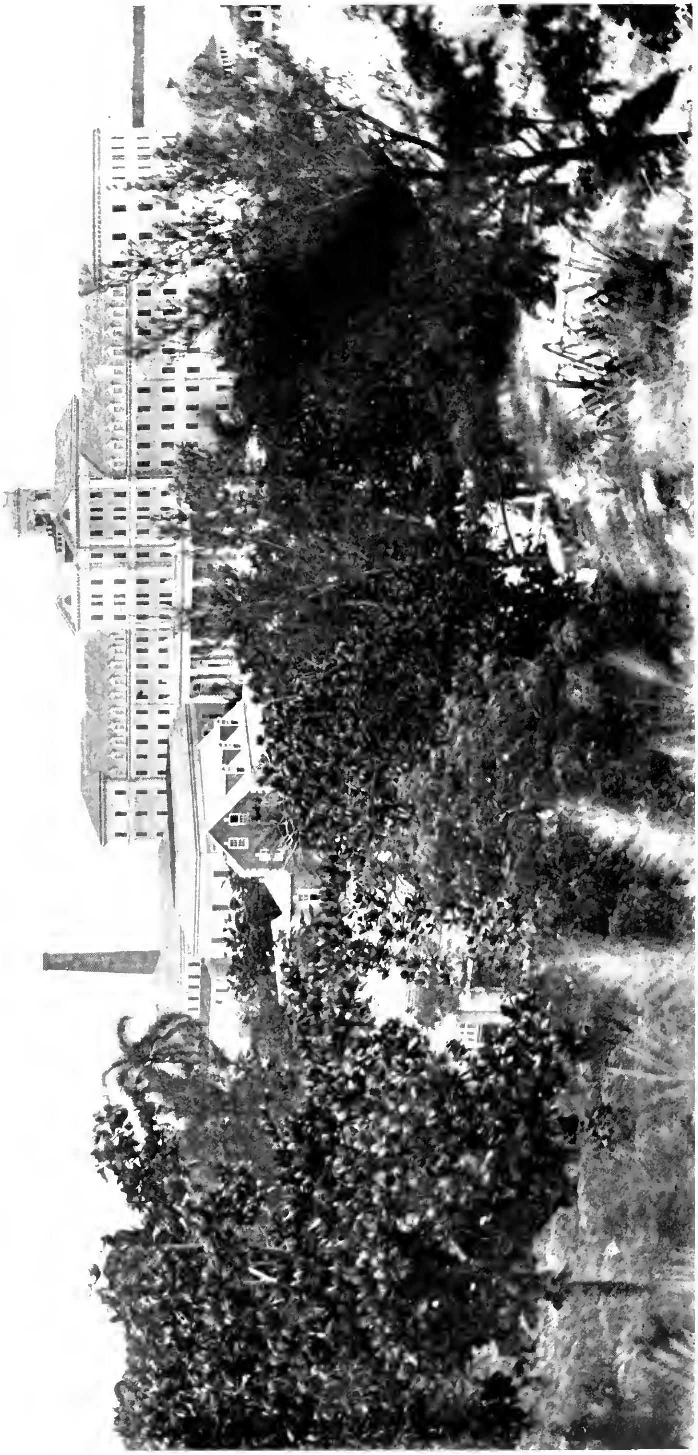
desire to enforce a better collection took the form of making the teachers the collectors, and adding a percentage of the amount received to their salaries. This did not have the desired effect. It did produce a slight increase in the salaries in some instances, but no noticeable improvement in the character of the schools. On the other hand it imposed a needless burden on the teachers whose function was other than that of collectors of school taxes.

For a long time there was no training school for teachers in the Colony. Not only did this cause a deficiency in the recruiting of the ranks of the teachers, but it allowed a deterioration of those already employed. The inspector insisted on the necessity of providing a normal school, repeating the recommendation from year to year, until at last, in 1892, such a school was established at Nassau.

Although determined efforts have been made to educate the negroes of the Bahamas, the results have not always been encouraging. But conditions have been adverse; finances have been low; the climate is decidedly against strenuous mental activity; the majority of the population is of a race that is not characterized by vigorous intellect; the people are poor for the most part; and many of the islands are cut off from frequent communication with the outside world of intellectual activity and culture, and even the knowledge of the existence of such things is beyond many of the population. Still the means of acquiring the rudiments of an education are here; the efficiency of the teaching staff has perhaps increased in recent years, and the schools are in a condition that augurs well for the good of the Colony. In 1888 the inspector reported that "all parents within the reach of these schools who choose to relinquish small inconveniences can secure for their children the benefits of a sound and useful education." This can with as much reason be said of the schools to-day.

Conclusion.

Within the last two decades the culture of the sisal (fiber) plant has become an industry in the Bahamas. It furnishes employment for an increasing number of laborers, and even in the short period in which it has been cultivated a substantial income has accrued to those engaged in its production. It remains to be seen whether this new enterprise will afford a more permanent source of wealth than other expedients that were tried before it. There are several other industries through which the inhabitants gain a livelihood. The more important among them are fruit-farming, especially that of pineapples,



VIEW OF COLONIAL HOTEL AT NASSAU

fishing, sponge-fishing, salt-raking, and the gathering of guano and marine curiosities. Cotton-planting barely survives, and the old, alluring industry of wrecking has almost passed away. Besides these things some of the inhabitants depend largely upon the hotel business, for Nassau, with her salubrious climate, is a health resort of importance. Not only private individuals but even the Colony itself has engaged in affording attractions, and providing comforts for tourists in the winter season. The local government made very liberal concessions to the present owner of the two largest hotels in Nassau in order to induce him to locate here. If finances are an index, the Colony is now enjoying a period of comparative prosperity. In the ten years up to 1902 the public revenue increased more than 32 per cent, imports nearly doubled and exports increased by one-third. In the same period the public debt increased considerably. A cable now joins Nassau with the coast of Florida, thus, as it were, bringing the place much closer to the outside world. Gradually the Colony is gaining improvements, that tend to make its island capital a more desirable place in which to live. But the emigration to the States of many of the more active spirits in the population often engages the attention of those who have local interests at heart, fearing lest it be taken as evidence of the lack of opportunity for the pursuit of attractive careers in this Colony.

SOME GENERAL CONSIDERATIONS RELATING TO THE BAHAMA ISLANDS

SOME GENERAL CONSIDERATIONS RELATING TO THE BAHAMA ISLANDS

BY

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INTRODUCTION.

Nassau, the capital of the Bahama Islands and chief port of entry, is situated on the north shore of New Providence and protected from the open sea by Hog Islands, a long, narrow strip of coral rock which acts as a natural breakwater. Between this breakwater and the town is the harbor of Nassau. It is in reality a channel between New Providence and Hog Island, about half a mile wide, and deep enough to accommodate large vessels. The value of the harbor is, however, impaired by a small island known as "Potters Cay." This cay so impedes the channel that vessels of over 200 feet in length are deprived of swinging room. Toward the eastern end the channel opens to shallow banks frequented only by small boats, and toward the western end the entrance is impeded by a dangerous bar, impassable when a heavy sea is running.

No words can describe the beauty of Nassau as one approaches the harbor from the sea. The ocean of deep sapphire suddenly changes to a lagoon of emerald green, surrounded by shores of snow-white coral sand. Beyond, the white limestone houses of the town, intermingled with groves of graceful palms, and half concealed by gorgeous poincianas, rise on a gentle slope against a sky of purest blue. The green, transparent water; the intense blue of the sky; the blotches of blood-red poincianas; the snow-white drifts of coral sand; the vivid green of the foliage—all these unexpected and yet harmonious contrasts strike the eye together, and stamp on the memory a picture of rugged beauty which nothing can efface. The impression thus received does not suffer when later the tourist wanders about the quaint old town, to examine at leisure the details of this picture. Nassau is a village

of picturesque homes and pretty gardens (Plate LXXXIII, Fig. 2). Every house has its flower garden where the pawpaw, datura, palm, oleander, banana, poinciana and bougainvillea grow and bloom together in careless beauty. As one strolls along the clean white streets, a surprise is in store at every turn; now it is the graceful drooping bells of the datura, a little later the delicate perfume from a hedge of oleanders, in the distance the brilliant crown of a poinciana, and in almost every garden the bougainvillea can be seen in all its glory (Plate I).

There is probably no cleaner or more wholesome town in the West Indies than Nassau. Its streets, built out of coral rock, are kept scrupulously clean (Plate LXXXVI, Fig. 1). They are smooth as asphalt, and being white do not absorb heat, a quality which well adapts them to a tropical country.

For the entertainment of tourists, two large and well-conducted hotels have been erected. One of these, the Royal Victoria, an old landmark of Nassau, was purchased by Mr. H. M. Flagler in 1898 and completely renovated. In addition to this he built on the water front another hotel, the Colonial (Plate XCI), large enough to accommodate six hundred guests. It is provided with every modern convenience, and forms a part of the vast hotel system which Mr. Flagler has built up along the eastern coast of Florida. There is also another hotel, the Clifton House, neat and well managed, but not so pretentious and less expensive than those just mentioned.

The former Governor of the Bahamas, Sir Gilbert T. Carter (Plate LXXXI), was an enthusiastic botanist, and devoted much time and attention to the gardens about Government House. Here may be seen brought together in one place, and artistically arranged, many of the most interesting of the native plants and some of the most beautiful exotics (Plate LXXXII). Nassau has none of the attractions which are frequently associated with many winter resorts, such as piers, stores of bric-a-brac, casinos, etc., but it has many attractions in which other resorts are lacking. One of the objects not to be overlooked is the huge silk-cotton tree, *Ceiba pentandra* (Plate LXXXVIII), which stands immediately behind the Postoffice. Aside from the striking appearance of this tree, it has an additional interest in that a sketch of it, which now hangs in the Public Library at Nassau, was made over a hundred years ago, in 1802. This drawing shows that the tree at that time had the same figure as to-day, and approximately the same proportions. It is difficult to

estimate the age of this tree, but it is said that it was the first silk-cotton tree brought into the Islands, and that it is the parent of all the others in the Bahamas. Beautiful and interesting nooks which give one an idea of the beauty of tropical vegetation are found among the ocean-holes in the estate of Mount Vernon. In the shady recesses of this quiet spot one can sit and sketch by the hour amid orchids, huge ferns, palms and other tropical plants (Plate LXXXIV, Fig. 2). New Providence is well supplied with good roads either for walking, riding or bicycling (Plate II, Fig. 2). And for one who likes to explore there will be found no end of diversion. Another delightful experience, which the tourist should not miss, is a visit to the celebrated Sea Gardens. These gardens, which are situated about five miles from Nassau in the channel between Hog and Athol Islands, is in reality a small coral reef. On looking down into the clear water, one sees the most gorgeous fishes (Plates LII-LXI) dart in and out amongst the various colored coral heads and waving plumes of gorgonias like butterflies in a garden of brilliant flowers. Other points of interest are the picturesque forts Charlotte and Fincastle (Plate LXXXIII, Fig. 1), which are located on the highest points of Nassau, and command a fine view of the harbor and the surrounding country. Nassau is also provided with a public library.

AREA AND POPULATION.[1]

According to Governor Rawson[2] the total area of the Bahama Islands amounts to 4424 square miles. This area is divided among 29 islands, 661 keys and 2387 rocks. Most of these islands are long and narrow, forming in reality little secondary archipelagoes. Andros, the largest of these island groups, consists of three islands, 146 keys and 355 rocks, and has an area of 1600 square miles, which is equal to about 36 per cent of the total area of the Bahamas.

The estimated population of the Bahamas for 1902 was 55,190. This would give an average of 12.5 persons to the square mile for the dry land area

[1] Many of the tables and much of the material for this and the following sections have been taken from the "Annual Report" of Governor Carter for 1902, published in March, 1904. This paper is one of the official documents of the Bahamas and has the title "General Descriptive Report of the Bahama Islands," in which is included the Annual Report for 1902.

[2] Bahama Blue-Book for 1866.

of the Islands. The births during the same year amounted to 2131, and the deaths 1299, showing a total increase of population of 838. The average birth rate per thousand was 38.6, and the average death rate per thousand, 23.5. About three-fifths of the entire population is colored.

CURRENCY AND BANKING FACILITIES.

Both English and United States money pass as security in the Bahamas. The British sterling silver money was declared the currency of the colony in 1839, but of late years American money is common and passes at its face value. In addition to this, the Bank of Nassau has a note issue of £6500. These bank notes are in circulation throughout the Islands, but especially in Nassau.

There are two banks in the Bahamas, both located in Nassau. The Bank of Nassau fills the place in the Bahamas that a national bank does in the United States. It has a capital of £10,000, with power to increase to £25,000. As just stated, its note issue amounts to £6500. The following statement of the liabilities and assets will give a good idea of the standing and the amount of business transacted by this bank:

GENERAL BALANCE SHEET OF BANK OF NASSAU FOR YEAR ENDING DECEMBER 31, 1902.

LIABILITIES.

Capital—fully paid				£10,000	0	0
Reserve fund				12,500	0	0
Due by the bank on current accounts and deposit accounts				35,271	10	1
Note issue				6,500	0	0
Profit and loss—amount brought forward	£ 198	12	7½			
Net profit for the year	2,631	13	4½			
				2,830	6	0
				£67,101	16	1

ASSETS.

Bahama government debentures £7,600 costing	£ 7,819	0	0
Bills of exchange for remittance	2,864	9	6½
Loans and discounts	27,037	3	2
Other debts due the corporation	4,518	3	9½
Due from other banks	18,002	11	5
Cash in hand	6,860	8	2
	£67,101	16	1

The second bank is a savings institution. It is a government enterprise attached to the general Postoffice at Nassau. Deposits are limited to £200 for any one person, and £40 for a single year. This bank had in 1902 a vested interest of £17,886 12s. 11d. The rate of interest is 2½ per cent. The following table illustrates the volume of business conducted by this bank:

FIG. 1.—CHARACTERISTIC HOMES OF SPONGE FISHERMEN

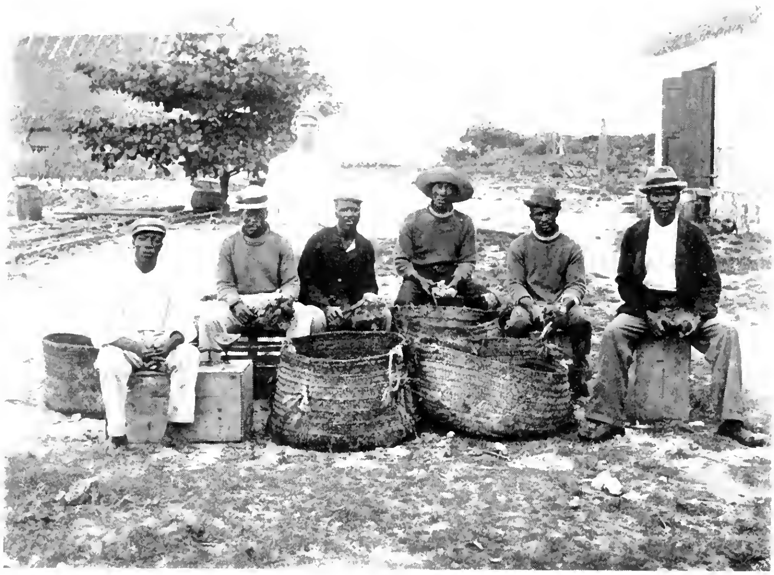

FIG. 2.—GROUP OF SPONGE FISHERMEN

VIEWS ILLUSTRATING GENERAL CONDITIONS

TRANSACTIONS OF THE POSTOFFICE SAVINGS BANK FOR THE FIVE YEARS, 1898-1902.

Year.	No. of Depositors.	Deposited during the year.			Withdrawals.			Interest added to accounts.			Balance due December 31.			Assets.		
		£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
1898	1,107	4,806	11	11	4,144	5	5	230	5	2	10,415	17	0	10,523	9	8
1899	1,240	7,205	1	0	4,822	12	10	270	11	1	13,068	16	3	13,277	0	10
1900	1,350	7,591	8	3	5,752	15	7	323	8	2	15,237	17	1	15,525	11	9
1901 :.........	1,421	7,664	15	11	6,846	4	2	378	10	1	16,434	18	11	16,842	1	6
1902*	1,480	1,145	4	7	4,166	9	11	195	18	6	16,607	12	1	17,886	12	11

*N. B.—For period, 1st January, 1902, to 30th June, 1902.

FACILITIES OF COMMUNICATIONS.

As there are no railroads in the Bahamas, the means of communication are confined to sailing boats, steam vessels, cable and postoffice service. The only means of travel among the various islands of the archipelago is the sail boat. Those which are confined to Bahama traffic and do not wander far away from the archipelago are small and of light draft. The necessity of this will at once be understood when the shallow nature of most of the Bahama waters is taken into consideration. During the winter months Nassau is connected with Miami, Florida, by means of steamships which sail every other day, and with New York with a similar line of steamships which sail about every two weeks. At the close of the winter outing season the Nassau-Miami line is discontinued. There is also a steamship service between Nassau and England.

There is a government cable service between Nassau and Jupiter, Florida. The volume of business transacted by this cable is indicated in the following table:

NUMBER AND CLASSIFICATION OF MESSAGES SENT AND RECEIVED ON THE GOVERNMENT CABLE FOR THE YEAR ENDING DECEMBER 31, 1902.

United Kingdom	424
Other points	2,835
Service	240
Total	3,499

Mail is delivered to the Out-islands by means of small sailing boats which cover their routes about every fortnight. The revenue received through the Postoffice for the twelve months from April 1, 1892, to March 31, 1903, amounted to £4303. The custom duties on packages passing through the Postoffice amounted in the same period to £638 18s. 3d. The total number

of money orders issued and drawn were 2228, representing an amount of money equal to £3299 7s. 6d. The following table will indicate the amount of business conducted by the Nassau Postoffice:

STATEMENT OF LETTERS RECEIVED AND DESPATCHED AT NASSAU POSTOFFICE FROM 1st APRIL, 1902, TO 31st MARCH, 1903.

	Received.				Despatched.			
	Letters.	Post Cards.	Newspapers and Books.	Total.	Letters.	Post Cards.	Newspapers and Books.	Total.
United Kingdom......	32,694	911	31,751	65,356	19,539	827	6,014	26,380
United States..........	86,587	2,006	44,428	133,021	65,100	5,497	6,327	76,921
Other Countries	152	4	12	168	13,197	1,055	2,911	17,163
Interinsular............	24,017	96	700	24,813	24,795	285	20,183	45,263
Total...............	143,450	3,017	76,891	223,358	122,631	7,664	35,435	165,730

Total number received..........	223,358
Total number despatched..........	165,730
Total..........	389,088

IMPORTANT INDUSTRIES.

As there are no mines in the Bahamas and no manufactories, aside from small pineapple preserving interests, the people of the Islands depend principally on the sponge-fisheries and agriculture for their livelihood.

THE SPONGE-FISHERY.

This is considered the most important industry in the Bahama Islands. In order to gather the crop of sponges during the fiscal year of 1901-2, 265 schooners of from five to forty-three tons burden and 322 sloops of from one to sixteen tons burden with an aggregate tonnage of 5952 tons were engaged. Attached to these there were 2517 open boats, while 291 in addition were engaged in the industry along the shores of the Islands. The large sea-going vessels were manned with 5517 men and boys, and the smaller boats along the shore with 445. In clipping, sorting and packing the sponges for export 258 men and women were employed. The method of securing and preparing the sponges for market is simple. A sponging schooner cruises over the shallow banks where the sponges grow and sends out its small boats with a man and boy in each. The man lies in the bow of the boat with a water-glass in one hand and a long sponge hook in the other. The boy stands in the stern to scull and guide the boat. As soon as a sponge of the proper quality and size is discovered on the bottom, the fisherman drops his hook, and by

a dexterous movement of the wrist and arm detaches the sponge and lands it safely in the boat. At intervals the boatmen land on unfrequented keys and throw the sponges on shore where the organisms are killed and decayed by the heat of the tropical sun. They are then rinsed out thoroughly in sea water, dried, sorted, and packed in bales for shipment (Plates XCIII and XCII, Fig. 2). The following table will give a good idea of the quantity of sponges shipped from the Bahamas to various countries during 1902:

TABLE SHOWING EXPORTATION OF SPONGES FOR 1902.

Country.	Quantity. lbs	Value. £
United Kingdom	179,797	8,867
United States	752,382	50,339
Canada	3,872	792
Holland	126,693	11,566
France	100,455	13,865
Germany	132,710	11,184
Russia	12,361	991

AGRICULTURAL PURSUITS.

The chief agricultural interests of the Bahamas are confined to the cultivation of pineapples, citrus fruits and sisal hemp. As the details of the production of these crops has been discussed in the chapter on "Soils of the Bahama Islands," they will not be reconsidered here; but a few statistics showing the relative importance of these three crops may be of interest. During 1902 pineapples to the amount of 521,482 dozens, at a value of £36,957, were shipped to the United States; in addition to this 47,892 cases of canned fruits were shipped, at a value of £9,515. Most of this canned fruit was pineapples. The following table gives the statistics of the production and value of the crop of citrus fruits for a longer interval:

TABLE SHOWING QUANTITY AND VALUE OF CITRUS FRUITS FOR THE YEARS 1898-1902.

Year.	Grape Fruit. No.	Price per M. £ s. d.	Oranges. No.	Price per M. £ s. d.	Total Export Value. £
1898	215,339	9 4 6	2,258,478	1 7 6	5,049
1899	87,799	4 15 9	482,628	2 14 6	1,600
1900	300,905	2 9 6	1,264,057	1 12 2	2,777
1901	470,426	4 10 3	3,001,173	0 19 2	5,011
1902	728,100	2 19 1	1,534,038	0 18 10	3,597

The production of citrus fruits is one of growing importance in the Bahamas, and it will be interesting in this connection to quote the observations of Governor Carter:

"It will be observed that prices show a considerable variation. So far as quality is concerned, it is doubtful if any adjacent country can produce

finer grape fruit than those grown in the Bahamas. Of late years Florida has been a keen competitor, and Jamaica and Cuba also send shipments to the United States market, but a tropical climate is not so suitable for the production of a good class of citrus fruits as a more temperate latitude, and the soil of the Bahamas seems to be specially adapted to their culture, especially in the more northern islands, where climatic conditions are also more favorable. In regard to oranges it barely pays to ship them; large quantities come from California and Florida, and there can be no doubt that the duty of one per cent per pound levied in the United States on foreign supplies places the Bahama growers at a disadvantage."[3]

SALT.

In former years the salt industry was one of the most important of the Bahamas. Inagua, Salt, and Rum Cays were large producers of this article until competition in the United States and lack of capital caused the industry to wane until at the present time it is of little importance. The manufacture is extremely simple: large reservoirs are constructed in the low lands, and canals dug connecting them with the ocean outside. Sea water is then admitted until the reservoirs are flooded, when the gates are closed and the imprisoned sea water allowed to evaporate. The salt is then raked into heaps, bleached in the sun, and sold largely for preserving purposes (Plate XC). It is estimated that 100 acres of salt ponds yield, under favorable conditions, 1,500,000 bushels of salt annually.

VOLUME OF TRADE.

It will be seen from the above discussion that the volume of trade of the Bahama Islands is not great. The nationalities taking part in the shipping industry embrace British, American, German, Spanish, Norwegian, Russian, Dutch, Cuban, Haitian and Dominican vessels. The following table gives a comparative statement of total shipping in and out of the Islands for the last five years:

TABLE SHOWING TOTAL SHIPPING IN THE BAHAMAS FOR YEARS 1898-1902.

Year.	Total Number of Vessels.		Total Tonnage.		Total Vessels and Tonnage.	
	Inwards.	Outwards.	Inwards.	Outwards.	Vessels.	Tonnage.
1898	595	597	371,878	369,644	1,192	741,522
1899	657	655	489,749	490,670	1,312	979,819
1900	623	619	557,211	556,653	1,242	1,113,866
*1901-2	757	754	648,049	645,631	1,511	1,293,680
1902	566	564	522,035	522,553	1,130	1,044,588

* 15 months.

[3] *Loc. cit.*, 36.

Great Britain and the United States furnish most of the supplies and are the chief markets for the Bahamas. The amount of exports and imports shown in the following tables is in proportion to the restricted number of vessels which enter and clear from Bahama ports:

TABLE SHOWING PRINCIPAL IMPORTS FROM THE UNITED KINGDOM AND THE UNITED STATES DURING THE YEAR 1902.

Imports.		United Kingdom.		United States.	
		Quantity.	Value.	Quantity.	Value.
			£		£
Cotton, woolen, linen and silk goods		Unenumerated.	20,844	Unenumerated.	23,190
Earthenware, glassware, &c.		"	6,345	"	33,395
Tinware, hardware		"	2,233	"	7,414
Preserved fruits, &c.		"	3,732	"	11,810
Ale and porter	gallons	8,068	1,184	3,958	683
Whiskey	"	2,978	1,345	547	294
Wines	"	1,437	565	1,255	536
Linseed and other oils	"	5,184	683	124,812	3,908
Rice	lbs.	2,046,072	9,051	207,154	965
Sugar (refined)	"	87,944	435	364,867	2,645
Sugar (unrefined)	"	739,257	4,129	60,086	363
Iron nails	"	......	....	109,234	745
Copper and yellow metal	"	16,650	353	4,306	129
Candles	"	7,904	176	5,439	138
Soap (common)	"	16,711	245	259,705	2,146

TABLE SHOWING PRINCIPAL EXPORTS TO THE UNITED KINGDOM AND THE UNITED STATES DURING THE YEAR 1902.

Exports.		United Kingdom.		United States.	
		Quantity.	Value.	Quantity.	Value.
			£		£
Bahama hemp	lbs.	8,814	92	2,336,497	37,482
Cascarilla bark	"	18,036	227	159,921	1,837
Sponge	"	179,797	8,867	753,382	50,339
Turtle-shells	"	16,773	6,707	3,886	1,979
Sea shells	barrels	678	481	2,007	1,399
Conch shells	No.	51,544	168	171,502	1,102
Canned fruit	cases	16	6	46,695	9,323

GOVERNMENT.

The Bahama Islands are governed as a Crown colony of Great Britain. The Governor, who is appointed by the Crown, serves six years, unless his term is shortened by removal or by death. To assist the Governor in the administration of the Islands, a legislature of twenty-nine members elected by the people of the Bahama Islands constitutes an Assembly. The representation in the Assembly is as follows:

TABLE SHOWING REPRESENTATION OF THE VARIOUS DISTRICTS IN THE ASSEMBLY.

Districts.	Members.
New Providence, City District	2
New Providence, Eastern District	2
New Providence, Southern District	2
New Providence, Western District	2
Harbor Island	3
Eleuthera	3
San Salvador	2
Exuma	2
Long Island	2
Crooked Island	1
Watlings Island and Rum Cay	1
Inagua	1
Abaco	3
Biminis and Grand Bahama	1
Andros Island	2
Total	29

In regard to the actual representation of these eleven districts, a statement of Governor Carter is most significant: "I do not hesitate to say that at the present time there is not suitable material in the Bahamas to make 29 members of a properly qualified Assembly representing the various islands comprised in this Colony. In the last Assembly not a single Out-island constituency was able to send its own representative, and it followed that the whole of the members were recruited from the island of New Providence, which in itself sends eight members to the Assembly."[4]

The public debt of the Bahama Islands amounts to £104,926 0s. 2d. In this connection it will be interesting to examine the following table, which gives the total revenue and expenditures of the Bahama government for five years:

TABLE SHOWING REVENUES AND EXPENDITURES OF THE GOVERNMENT FOR THE YEARS 1898-1903.

Year.	Revenue. £	Expenditure. £
1898	74,382	64,148
1899	76,697	68,748
1900	78,651	82,837
1901-2	77,789	81,135
1902-3	72,442	74,614

In the next table will be seen a statement of the assets and liabilities of the Colony on March 31, 1903:

[4] *Loc. cit.*, p. 13.

TABLE SHOWING ASSETS AND LIABILITIES OF THE BAHAMA GOVERNMENT ON MARCH 31, 1903.

Assets.	£	s.	d.	Liabilities.	£	s.	d.
Cash in chest	2,167	5	3	On current accounts	1,420	6	0
Balance in hands of Out-island Collectors and in transit	328	18	1	Savings Bank (due to depositors) including interest to 30th June, 1902 ..... £16,607 12 1			
Balance in hands of Crown Agents	1,995	9	7	Advance from Treasury 800 0 0			
Investments on account of Surplus Funds	5,720	8	5				
Investments on account of Hotel Fund	8,177	6	10				
Cash on deposit of Hotel Fund	1,026	0	2		17,407	12	1
Savings Bank, invested to 30th June, 1902	17,631	15	7				
Crown Agents, invested to 30th June, 1902	......						
Income Tax invested to 30th June, 1902	71	1	7				
Savings Bank balance, cash invested to 30th June, 1902	180	15	9				
Cable Repair Fund—Invested	8,130	11	1				
Cable Repair Fund—Cash	1	3	9				
Total	15,433	16	1	Total	18,827	18	1

The government institutions, such as hospitals and asylums, have been discussed at length in the chapter on "Sanitary Conditions." They will not be considered here further than to give the following two tables:

TABLE SHOWING PATIENTS RECEIVED AND TREATED IN THE GOVERNMENT HOSPITAL BETWEEN APRIL 1 AND DECEMBER 31, 1902.

	Males.	Females.
Number in hospital, 1st April	62	43
Number admitted	202	111
Daily average in hospital	49	47
Patients discharged cured	106	53
Patients discharged relieved	49	22
Patients discharged not improved	9	5
Number who died in the nine months	32	21

TABLE SHOWING PATIENTS IN THE GOVERNMENT INSANE ASYLUM ON DECEMBER 31, 1902.

	Males.	Females.
Maniacal and dangerous	11	7
Quiet chronic	5	5
Melancholy	1	—
Idiotic	4	2

CONDITION OF PEOPLE.

From an examination of the charts which have been given in the preceding discussion it will be correctly inferred that the people of the Bahama Islands as a rule are not wealthy. The scale of living is not high and an individual in the possession of what would be considered a moderate income in the United States would in the Bahamas be regarded as rich. In

such towns as Nassau, Governors Harbor and Georgetown the inhabitants represent probably the most influential classes in the Islands. The people are, as a whole, well housed and well clothed. In many of the Out-islands the inhabitants live in cabins built of limestone and covered with plaster. This is the condition of many of the people who are employed in the sponging industry (Plate XCII, Fig. 1). In the larger towns limestone blocks are cut from quarries by means of common log-saws and wood axes. These are trimmed to the desired shape and constitute the only building stone in the archipelago. Plate LXXXIX shows one of these limestone quarries in operation, and a building in process of erection. Although the majority of the colored people and a great many of the white inhabitants are able to provide themselves with few of the ordinary comforts of life, yet there is no occasion for an able-bodied man or woman to be without the necessities. In the Out-islands, where medical attendance is wanting, there is frequently much misery on account of the neglect of ordinary sanitary precautions. Taken as a whole, it may be said that the people are contented but not prosperous.

Criminality.

In regard to criminality, the following statistics for the year 1902 are of interest. During this period there were committed to jail 254 people, of whom 156 were men, 86 women, and 12 juveniles.

The following table gives the criminal statistics for the years 1899, 1900 and 1902:

TABLE SHOWING CRIMINAL STATISTICS FOR YEARS 1899, 1900 AND 1902.

	1899.	1900.	1902.
Apprehended by the police or summoned before the magistrates....	2,508	2,636	2,827
Number of summary convictions:—			
For offenses against the person..........................	246	237	290
For praedial larceny	37	31	35
For offenses against property other than praedial larceny.....	80	76	101
For other offenses	1,460	1,600	1,756
The number of convictions in the Superior Courts:—			
For offenses against the person..........................	10	7	10
For praedial larceny	..	..	1
For offenses against property other than praedial larceny.....	15	12	16
For other offenses	1	2	6
The number of persons acquitted:—			
In the Inferior Courts	464	438	385
In the Superior Courts	21	8	20

Religious Conditions.

Nassau is the seat of a bishopric, and the Bahamas are well supplied with churches of Episcopal, Presbyterian, Wesleyan and Baptist denominations.

FIG. 1.—VIEW OF SPONGE EXCHANGE AT NASSAU

FIG. 2.—VIEW OF A SPONGE YARD AT NASSAU

VIEWS ILLUSTRATING GENERAL CONDITIONS

Education.

It has been shown in the chapter on "The History of the Bahamas" that the educational requirements in these Islands has been constantly increased. Under the present law all parents are required to send their children to school between the ages of six and thirteen. Education is non-sectarian, and no catechisms or sectarian exercises are permitted in any of the public schools.

There are two classes of public schools in the Bahamas, those which are supported by the government, known as "Board Schools," and those which are assisted by the government, known as "Assisted Schools." No fees for education are charged at any of the public schools. The following table shows the number of schools of both classes with their attendance for the years 1899-1902:

TABLE SHOWING SCHOOLS AND ATTENDANCE FROM 1899 TO 1902.

	1899.	1900.	1901.	1902.
Number of schools wholly maintained out of the annual grant	41	43	44	45
Number of schools which received grants in aid	11	11	12	15
Number of pupils who attended Board Schools during some portion of the year	7,074	6,935	6,940	7,432
Number of pupils who attended the Assisted Schools during some portion of the year	1,061	1,020	1,122	1,434
Number of names on the rolls (Board Schools)	5,772	5,776	5,848	6,243
Number of names on the rolls (Assisted Schools)	952	919	992	1,296
Average attendance (Board Schools)	4,001.4	3,917	3,984	4,416
Average attendance (Assisted Schools)	575	569	614	887
Total number of schools	55	54	56	60
Number of scholars present during some portion of the year	8,090	7,955	8,102	8,866
Average number of names on the rolls	6,724	6,695	6,840	7,534
Average attendance	4,577.4	4,486	4,598	5,223

The total cost of the Department of Education for the year ending 1902 is £5001 12s. 2d.

In addition to public schools there are facilities for higher and sectarian education at Nassau. Queen's College, a Methodist institution, takes pupils of both sexes. St. Andrews Hall is under Presbyterian management. The Roman Catholic Church is also represented by an academy for higher education and by two schools for elementary education. In regard to the education of the Bahamas as a whole, there is no one who can speak with better authority than Governor Carter. It will be interesting in conclusion, therefore, to read what he has to say on this subject:

"I fear that in this Colony the type of education provided under the auspices of the government is not that which is best suited to the needs of the masses, and if any real progress is to be effected, a radical alteration must be made in the present system. It may be said that none of the boys reached by the Education Act proceed with their studies after leaving school. As a rule the main object of the parents is to get them away from school, so that their services may be utilized on board a sponger or in some form of manual labor. In the very unlikely event of a boy showing an aptitude for book learning, and making the best use of his training, his great ambition is to become a clerk in a store, or possibly to enter the government service. But the demand for this form of labor is extremely limited, and very poorly remunerated, whereas there is need for a good class of artisans. At present there is not one master carpenter, blacksmith or mason in the Colony, and no means of training these and possible exponents of other industrial arts. There are men who build houses and small craft, and fashion wood and iron into various shapes; but it is the 'rule of thumb' which reigns, and there is little of the precision which comes of the trained hand and eye in conjunction with a trained mind. What is wanted here is a system based on that so ably conducted by Mr. Booker Washington at Tuskegee, Alabama, United States of America, and until that or some similar scheme based upon industrial training as the main factor in the educational method is adopted, I fear that no improvement in the condition of the large native population in this Colony will be manifested. It is easy, however, to make destructive criticism, but although an alternative system may be advocated, it is almost impossible in a Colony like this, where the revenue is never sufficient for the calls upon it, to make the radical change which would be necessary in order to place this question upon a proper foundation, and unfortunately so far little disposition has been shown by the legislature to assist the government in its efforts to encourage practical agriculture, which, after all, is the industry upon which the mass of the people must rely, and about which at present they know next to nothing."[5]

[5] *Loc. cit.*, p. 45.

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ERRATA

Page xxiv, line 1; for 269 read 268.

line 17; read

LIII. *Tylosurus caribbæus* Le Sueur (Hound Fish, Silver Gar) 302

line 27; read

LXI. *Pomacanthus arcuatus* (Linnaeus) (Black Angel Fish) 362

line 28; read

LXII. Views illustrating Mammals 374

line 33; read

LXIII. Views illustrating Mammals 378

Page xxv, line 22; read

LXXII. Views illustrating Sanitary Conditions 444

Page 42, line 29; for *Opisthosolen biformis* read *Chondropoma biforme*.

line 31; for *Opisthosolen biformis* var. *bahamensis* read *Opisthosiphon bahamensis*.

line 32; for *Opisthosolen* read *Opisthosiphon*.

line 35; strike out entire line.

Page 264, second line from bottom; for *Rachicallis* read *Rhacicallis*.

Page 300, line 11; read

TYLOSURUS CARIBBÆUS Le Sueur (Hound Fish, Silver Gar).

Plate LIII.

line 15; strike out entire line.

Page 312, line 17; strike out entire line.

line 21; add Plate LXI.

Page 380, line 9; for (Miller) read (Müller).

line 12; for (Miller) read Miller.

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